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PREFACE

Bismillaahirrahmaanirrahiim
Assalaamu'alaikum warahmatullaahi wabarakaatuh.

Praise always we pray to God Almighty for giving us the abundance of grace, guidance and inayah, so that we all can met in the "1stInternational Conference on Science and Technology (ICST) 2016". ICST is a conference where researchers can share and publish their scientific papers about science and technology. The theme of this conference is "Emerging Innovation on Science and Technology for Sustainable Development".

This conference was done for two days, from 1st to 2nd December 2016, and took place in the Green Campus of the University of Mataram.

We received more than one hundred papers from various universities and research institutions in Indonesia and from overseas, but not all of the papers were published in this proceeding. The paper has been selected and grouped based on the similarity of the research field, which then are presented and discussed. Presentation of the papers will be held in eight parallel classes.

At this moment, the organizing committee would like to expressour gratitude to all of you who have participated this conference, especially to the all keynote speakers, presenters who have submitted posters or orally presented papers and also to the participants. Our special gratitude also goes to the Rector of the University of Mataram who has been highly supporting this conference. Last but not least, the organizing committee would like to thank to all of you who have supported this conference.

Wassalamu'alaikum warohmatullahi wabarakatuh.

Chairman of 1st ICST 2016

Dr. Satrijo Saloko

OPENING SPEECH - RECTOR THE UNIVERSITY OF MATARAM
The 1st International Conference on Science and Technology 2016

Respected Guests,
Keynote speakers,
Conference participants,
and all other participants.

On Behalf of all staffs of the University of Mataram, I welcome you all to Lombok, a beautiful island in West Nusa Tenggara Province, where the University of Mataram is located. Lombok is known for its natural and cultural diversity where you can enjoy traditional cuisines, beaches, waterfalls, mountain, traditional villages and handicraft of many ethnics including Sasak, Samawa, Mbojo, Balinese, Chinese, Arabic, and many others.

As the Rector of the University of Mataram, it is a great honour for me to address the opening of "The 1st International Conference on Science and Technology" here at the University of Mataram, which will be held from 1th to 2nd December 2016, with a theme "Emerging Innovation on Science and Technology for Sustainable Development". The main aim of this seminar is to gather scientist from all over the world to share their ideas, knowledge and experiences and to build network for possible future collaboration.

As we are aware that sharing knowledge and experiences from speakers are extremely valuable in a conference, therefore I would like to express my high appreciation, first, to the keynote speakers from overseas and from Indonesia for their willingness to come to Lombok to share their acknowledged works. Your effort and contribution to this conference are absolutely valuable. Second, my high appreciation also goes to the national speakers and all other participants, including the speakers from University of Mataram and local universities in West Nusa Tenggara Province, your participation in this conference not only will give incredible share of ideas, skills and knowledge that

you have, but also will improve the academic environment that we are developing in this university. I hope this conference will be a good forum, not only for communicating and sharing ideas, knowledge and experiences, but also for building networking for future collaboration.

I would also like to take this opportunity to express my appreciation to the sponsors which have given some contribution to this conference. Last but not least, I would like to thank the organizing committee as well as all other supporters and participants, without their effort, commitment and hard work, this conference will not run well.

Finally, I wish you most successful conference, enjoy Lombok Island and hope to see you again in other forum here at the University of Mataram.

Rector of the University of Mataram

Prof. Ir. Sunarpi, Ph.D

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The addition of bottom ash on the photodegradation of methylene blue the lowest yield. Omission in this state due to photodegradation by OH· radicals that only comes from the photolysis of water.

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Based on the results of research and discussion can be concluded as follows:

1. Immobilization of TiO_2 on bottom ash gave higher fotoaktivitas, both on the photodegradation and the adsorption of methylene blue than the pure TiO_2, and bottom ash with the results of effectivness degradation is 88.25%, 61.23% and 19.57%.
2. The increase in the concentration of Ti (IV) which rest upon the bottom ash to increase levels of TiO_2 in the TiO_2-bottom ash with the same degree of crystallinity. And rising levels of TiO_2 which rest upon the bottom ash to increase the effectiveness of photodegradation of methylene blue dye.

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Design of Low Frequency Vibration Generator As Seismic Sensor Calibrator with Optocoupler Counter

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Abstract

A sensor is an important component in measuring and controlling system. Several sensors use the high technology to fabricate such as a vibration sensor. Consequently, its make a vibration sensor have a high price and rarely in the market. Therefore, many researchers develop it to get a sensor with good a characteristic and low price. In order to get a good characteristic of vibration sensor, we required the low frequency vibration generator as sensor calibrator. This paper presents the design of a low frequency vibration generator instrument as a seismic sensor calibrator using an optocoupler counter sensor. The vibration generators consist of a mechanical and an electronic system with separate in two different boxes. A direct measurement was conducted to measure the sensor output and the time to count the frequency. The accuracy and precision were determinate based on the indirect measurement (statistical and graphical analysis). Testing result of the instrument shows that the sensor accuracy is about 94.2% with average of correctness 0.955. Accuracy average of vibration generator is 0.98 and the precision is about 0.976.

Keywords *: vibration generator, low-frequency, seismic sensor, calibrator, optocoupler counter*

1. Introduction

Sensor is a primary electronic component that used in the measurement system or control system. A sensor can be applied to built a system that works automatically and able to analyze the phenomena that occur in the nature. Sensors are used to construct a type of measurement or control system according to the physical quantity that can be sensed by a sensor such as the detection of vibration. Wirawan et al. (2012) develop an instrument based on the ultrasonic sensor to measure the vibration frequency of the object [1].

Vibration detection is able to provide vibration parameters that detected by sensor. Through this information can provide an early warning to prevent fatal damage due to the effect of vibration. This detection system is required to detect vibration and engine work analysis, vibration power bridge analysis, building strength vibration analysis, and earthquake. Especially for the natural vibration like an earthquake, it's requiring vibration measurement in the low frequency. For the purposes of developing a vibration detector, there are many varieties of sensors and other devices that response a vibration such as geophone sensors, piezoelectric, accelerometer, and etc. Generally the sensor material is semiconductor, optic materials, or metal and its need high technology to build a sensor. In 2011, we develop the vibration sensor based on the fluxgate [2]. In order to test the reliability and the characteristic of a vibration sensor system, especially for the low frequency vibration, we required the vibration measuring instruments especially for test equipment, calibrator, and vibration generator.

The low-frequency vibration generator produces low-frequency mechanical vibration wherein one of these vibrations is an earthquake vibration with the dominant frequency range from 1 to 5 Hz. In this paper, we present the design of a low frequency vibration generator instrument as seismic sensor calibrator. We were using a DC motor as an actuator and optocoupler sensor as counter sensor. DC (direct current) motors converts direct current electrical energy into mechanical energy [3]. DC motors are used because of its speed can be varied so that it can be used to regulate the frequency. In addition, DC motors also have high torque, linear performance, and simpler control system [4].

2. Materials and Methods

There are two types of work conducted in this research i.e. hardware and software design.

2.1 Hardware design

The design of Low Frequency Vibration Generator as Seismic Sensor Calibrator with Optocoupler Count can be seen in Figure 5. The main component that used in this the design are DC motor, optocoupler sensors, liquid crystal display (LCD), ATMega 8535 microcontroller. In order to produce an accurate data, its must complete a certain specification that give a description of the research product. There are two types of specifications, design specifications (Figure 1) and performance specifications. A performance specification is to identify the functions each of the components form the system, while design specifications also called the functional specification.

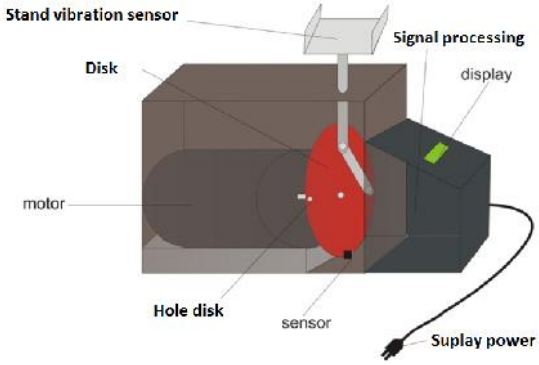


Figure 1 Design of low frequency vibration generator

The instrument has separate mechanical and electronic systems. Mechanical system and electronic system is connected by connecting cables. Both of these systems were deliberately separated so that the resulting vibration actuator does not interfere with the performance of the electronic components.

2.2. Software design

The controlling program that will be embedding to the microcontroller chip in order to control of the instrument work was written. The program was build using the CodeVision AVR program based on C programming language. Figure 2 shows the flowchart of the controlling program.

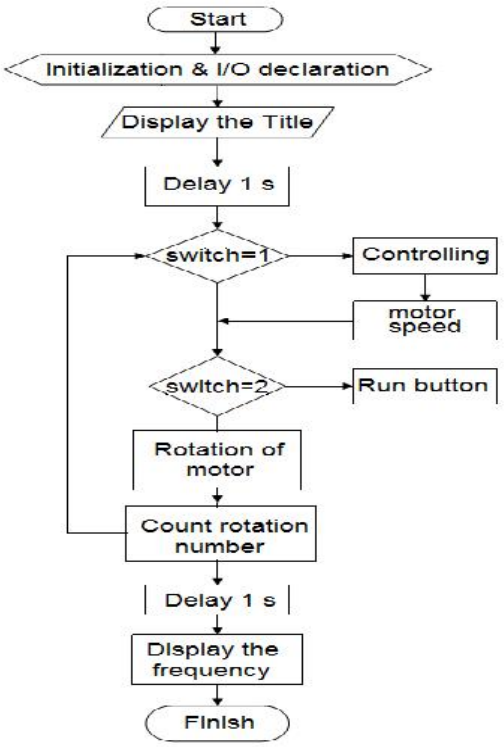


Figure 2 Flowchart of the controlling program

The measurement results can be expressed in a specified average value, standard deviation, and the relative and absolute error of measurement results. The accuracy and precision of the system was determined using the theory of errors. The percentage of error can be determined based on the equation:

$$\% \text{ Percent error} = \frac{Yn - Xn}{Yn} \times 100\% \quad (1)$$

where *Yn* is an actually value and *Xn* is the value measurement.
For the relative accuracy (*A*) of a measurement system can be determined by the following equation [5].

$$A = 1 - \left| \frac{Yn - Xn}{Yn} \right| \quad (2)$$

and the precision of a measurement can be expressed in mathematical form as follows:

$$\text{Precision} = 1 - \left| \frac{Xn - \overline{X}n}{\overline{X}n} \right| \quad (3)$$

where *Xn* is the value of the n-th measurement and $\overline{X}n$ is the average of a set of n measurements.

3. Results and Discussion

The Figure 3 shows the low frequency vibration generator that has been made. The low-frequency vibration generating consists of two parts i.e. an electronic circuit system (Figure 3a) and a mechanical system (Figure 3b) that placed in two different boxes. The electronic circuit system of low-frequency vibration generator consists of a power supply circuit (1) as a current source, PWM (2) as a DC motor speed control, microcontroller minimum system (3) as the centre of controlling program of the systems, and optocoupler

sensor circuits (4).

(a) (b)

Figure 3. Low-frequency vibration generators.

The mechanical system consists of several components i.e. a vibrating lever (1) that functions transform transformation circular motion into vertical motion, DC motor (2) function for the driving source (actuator), torque driver (3) serves to provide more big torque on vibrating sleeve, disc (5) and optocoupler sensor (4) for chopping round amount of low frequency vibration generator as shown in the inset of the Figure 3b. The number of vibration, time and the frequency will be displayed in the LCD module. In order to operate this generator, there is a button which serves to start the running system, to stop system and restore the original position readout. In addition to control the motor speed there is a rotary switch. When the DC motor rotates, it will rotate a disc and moving the arm to vibrate vertically.

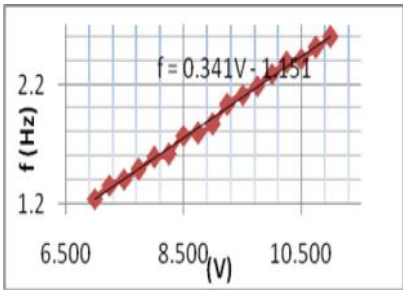
Data analysis was performed on the low-frequency vibration generating system includes sensor characteristics, PWM output voltage relationship of the adjustments are, as well as the accuracy and precision of generating low-frequency vibration.

3.1. Accuracy and precision of optocoupler sensor

Optocoupler sensor emits infrared light from the transmitter to the receiver. When the transmitter and receiver blocked by obstacles, it will cause changes of the sensor output voltage. From the datasheet, the output voltage sensor is about 5 volts. The obtained measurement shows that the blocked voltage is 4.71 volts and the unblocked voltage is 0.0065 volts. According to this measurement result, the accuracy of the sensor is 94.2%. The discrepancy of the voltage due to the influence of the sensor cable is long enough so that the voltage drop occurs in the sensor. In addition, the repeated measurement of the sensor in case of blocked and unblocked was conducted to obtain the sensor precision. The unblocked optocoupler sensor precision is 0.999, whereas the blocked precision is 0.892.

3.2. Correlation between frequency and DC motor input voltage

The correlation between the input voltage DC motor with frequency is shown in Figure 4.



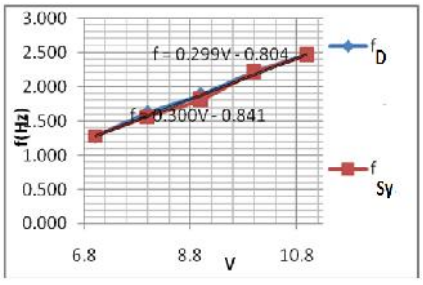


Figure 4 The correlation between the voltage and frequency.

Figure 5 Graphic of the frequency accuracy (f_D vs f_{Sy}).

From the graph it can be seen that increases of voltage make the frequency increase too. The correlation of frequency and the voltage can be depicted by the following regression line equation $f = 0.34V-1.151$where the coefficient 0.34 is the sensitivity to changes in voltage DC motor speed and the 1.151 constant is the initial frequency.

3.3. Low-frequency vibration generating accuracy

The accuracy of a low-frequency vibration generator is determined by comparing the measured data (f_D) to a standard measuring system (f_{sy}). The precision of the low-frequency vibration generator can be seen in graphic of the Figure 5. The graphic shows the comparison between the measured frequency curves and the frequency count. Measurements and calculations results which represented by two line with the line equation $f = 0.299V-0, 804$ for a measurement and $f = 0.3V-0, 841$ for a calculation. The error percentage range is from 0% to 4.3289%. Meanwhile, the accuracy of the vibration generator systems ranged from 92% to 99%.

3.4. Absolute and relative error

For the 10 times of measurement, the average accuracy of low frequency vibration generating is 0.976, while the average error is 0.019. Absolute error of low frequency vibration generating system can be seen in Figure 6.

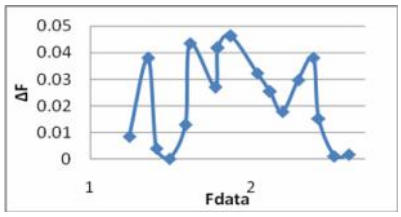


Figure 6. The graph of an absolute error

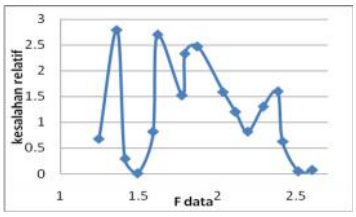


Figure 7. The graph of relative error

Based on sinusoidal shaped graph the Figure 6, the maximum of an absolute error values is 0.046. Meanwhile, the relative error of the system is ranged from 0% to 2.793% as shown in Figure 7.

4. Conclusion

Based on the analysis results of a Low Frequency Vibration Generator as Seismic Sensor Calibrator With Optocoupler Count that has been done, it can be drawn some conclusions that the accuracy of low frequency vibration is about 94.4%, the precision of the sensor is obstructed during 0.892 and 0.999 when there is unobstructed, with a relative error is 0.279. The generated voltage influences proportionally the vibration frequency. The average accuracy of the low-frequency vibration generator system is 0.98% with an average relative error 1.90%.

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Measuring and Mapping Carbon and Nitrogen in Indonesian Tropical Soil using Rapid Technique of Near Infrared Technology

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Abstract

Measuring and mapping soil carbon (C) and nitrogen (N) using conventional laboratory analysis (e.g. Walkley&Black and Kjeldahl method, respectively) is high cost and time consuming. The cost can be more expensive for producing spatial and temporal mapping of soil C and N, due to more samples needed. Near Infrared Spectroscopy (NIRS), which is known as a rapid and inexpensive technique with no chemical needed, has been successfully able to rapidly measure soil C and N in laboratory and in the field. The aim of this research is to develop rapid and cheap technique from soil reflectance in measuring and mapping soil C and N which in turn can be used as a basis of site specific fertilizer recommendation. Soil samples were collected from tropical soil of Kayangan Area of North Lombok Indonesia which were then analysed using convensional analysis and scanned by NIRS. Partial Least Square Regresion (PLSR) models were built from reference data (conventional analysis) and spectral data (NIRS). The models were moderately successful to measure soil C and N from spectral reflectance, both using cross-validation test and using separate validation sample set. This indicates that soil C and N from Indonesian tropical soils of North Lombok can be rapidly measured and mapped using Near Infrared Technology.

Keywords: *Soil, carbon, nitrogen, rapid measurement, mapping, near infrared*

1. Introduction

Measuring soil carbon (C) and nitrogen (N) using conventional methods (e.g. Walkley & Black and Kjeldahl method, respectively) is high cost and time consuming. Soil samples have to be collected, dried, ground, sieved and analyzed in laboratory (Minasny *et al*, 2013). The cost could be much higher for mapping soil C and N status in more detail scale, due to more samples needed. So, it is usually coarse scale map (e.g. 1:500,000 or coarser) is affordable if we only rely on the conventional methods. Hence, detail scale of soil nutrient map is extremely needed for site specific fertilizer application in order to put fertilizer with the right amount and at the right place.

Ideally, prior to fertilizer application, it should be available a detail scale of soil nutrient map which can be used to guide the farmer to apply the right kind and amount of fertilizer (Kodaira and Shibusawa, 2013). Higher amount of fertilizer should be applied at the area with lower content of soil nutrient, and vice versa. At the current situation, however, fertilizer (organic and inorganic)

recommendation is commonly based on regional recommendation, which may cause inefficient use of fertilizer which can be below or above ideal recommendation rate (*personal communication*). In fact in the field, soil nutrient status can be very different from one place to the other places, which need different amount of fertilizer. Thus rapid and inexpensive technique is needed to measure and map soil C and N for site specific fertilization (site specific management).

Near infrared spectroscopy (NIRS), which is rapid and inexpensive technique and no chemical needed, has become an extremely important analytical technique in recent years (Stenberg et al, 2010). It is used to analyze a wide range of samples from gas, liquid, to solid (Stuart 2004). It is used to measure organic composition and functional properties in e.g. crops, food, animal feed, pharmaceuticals, polymers, textiles, brewing materials, petroleum hydrocarbons, pulp and paper, as well as for medical analysis, and environmental analysis (e.g. soil, aquatic sediments, bio-solids such as manures and compost) (Malley and Martin 2003). In recent years great advances have been made in using near infrared technology to investigate soil properties (Cozzolino *et al*, 2013).

An NIR reflectance spectrum represents a composite of all the optical information of the outer layer (a few millimeters thick depending on the surface and structure composition) of a substance (Ozaki et al, 2007). This complex spectrum, which is rich in information, can be interpreted on a basis of chemical and physical composition (Workman and Shenk 2004). NIRS is based on the interaction of near-infrared radiation with soil constituents particularly the covalent bonds of small atoms such as O, C, H and N, abundant in organic matter (Ozaki et al. 2007). It has the potential to be a rapid technique if it is properly calibrated (Kusumo et al, 2008). Developing robust calibration model is the key success of NIRS technology application. Using multivariate analysis, such as partial least square regression (PLSR), the spectral and reference data can be proceeded for the calibration model development to characterize and quantify soil constituents (Workman and Shenk 2004).

One of the earliest NIRS successes in soil science was the successful determination of soil water content (Dalal and Henry, 1986). Then, it has been used successfully for measurement of total C and N (Chang *et al*. 2002; Kusumo *et al*. 2008). The use of NIRS techniques was then extended to simultaneously measure other soil physical and chemical properties (Cozzolino and Moron, 2006). Most of the success of NIRS technique is for measurement of total C, organic C, total nitrogen (N), cation exchange capacity (CEC) and soil moisture content (Stenberg et al, 2010). This technique later is expanded to measure root density (Kusumo *et al*. 2009; 2010; 2011), soil fertility (Genot *et al*, 2011), soil pH (Tekin *et al*, 2013), biochar stability indices (Kusumo *et al*. 2014) and in more recent year for soil structural quality assessment (Askari *et al*, 2015). Mapping soil properties using NIRS has been reported by some workers (Minasny *et al*, 2013). It has been successfully used to map soil C and N (Kodaira and Shibusawa, 2013; Vagen and Winowiecki, 2013). While, Kodaira and Shibusawa (2013) have successfully map soil moisture content, organic matter, CEC, total C, ammonium N, nitrate N, total N, available P, and P absorptive coefficient, using NIRS.

Kayangan agricultural area in North Lombok is planned to become fruit and vegetables producer by North Lombok Government. Beside its suitability for fruit and vegetables, there is a high potential market for tourism area in Gili Trawangan, Gili Meno and Gili Air, which is quite close to the Kayangan area. Fruit and vegetables for the hotels and restaurants are supplied mostly from Bali and Java and some from Mataram (Lombok). These tourism destinations are very famous, thus massive number of international tourists visit these places every year to enjoy the beautiful beach and coral. Development of Kayangan area for agricultural use faces obstacle; it doesn't have soil nutrient map which can be use the basis of efficient fertilizer application. If we can map this area into several levels of nutrient status and then the fertilizer recommendation is based on the

status of each specific site, effective and efficient use of fertilizer will be obtained and this will support sustainable agriculture development. Because mapping soil properties using conventional methods is very expensive, so rapid and inexpensive technique (NIRS) is extremely needed.

From the above information, "development of rapid and cheap technique from soil reflectance in measuring and mapping soil carbon and nitrogen for fertilizer application" is undoubtedly needed. It is expected that effective and efficient use of fertilizer can be achieved, excessive use of fertilizer can be avoided, and leaching and negative impact of excessive fertilizer can be avoided.

2. Materials and Methods

2.1. Soil sample collection

Top soils (0-10 cm depth) from 305 points were collected using soil corer from study area of Kayangan North Lombok Indonesia, covering the total area about 2,986 ha. Soil corer with diameter 2.54 cm was used to collect the soil samples. When samples were collected, the position and altitude of each sample was recorded. The samples were put into plastic bags and put codes, then took to the laboratory for soil preparation.

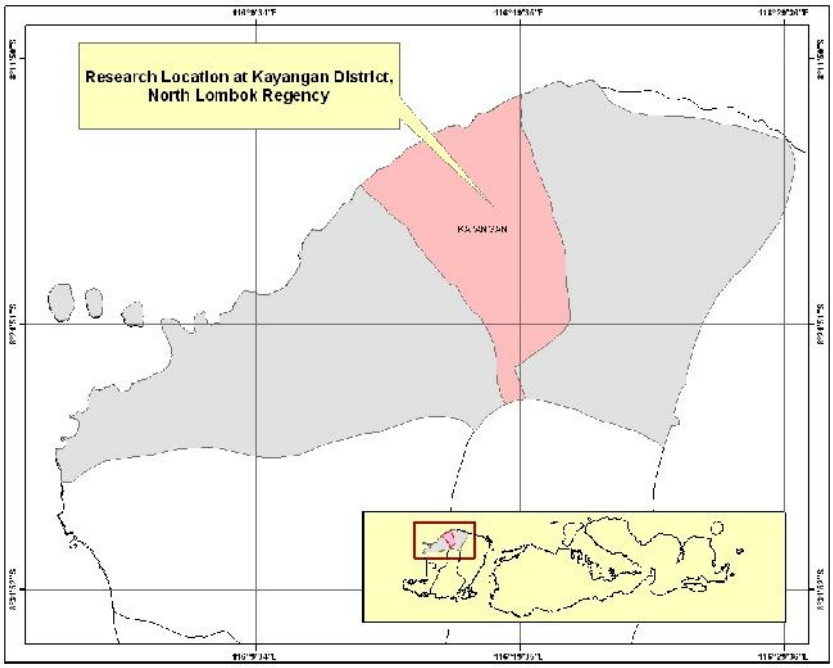


Figure 1. Map of Kayangan agriculture development area in North Lombok, and insert is the West Nusa Tenggara province.

2.2. Soil preparation and analysis

Soil samples were transported to laboratory which be then dried (air dry), ground and sieved to pass 0.2 mm diameter sieve. Part of each sample was analyzed for soil carbon (Walkley and Black method) and nitrogen (Kjeldahl method), then another part of each sample was scanned using Near Infrared Spectroscopy (NIRS).

2.3. Spectral acquisition and spectral pre-processing

Spectral reflectance (UV, visible and NIR range; 350 – 2500 nm) were acquired using a soil

contact probe (supplied by ASD) attached by fibre optic cable to the spectrometer–ASD FieldSpec 3 V-NIR Spectrometer (Analytical Spectral Device, Boulder, CO, USA). The spectrometer provides spectra from 350-2500 nm with 1 nm resolution. The spectral data were then imported to a software (ParLeS; Viscarra Rossel, 2008) for spectral pre-processing. The data underwent pre-processing steps namely: transformation to log (1/R) - R, wavelet detrending, and smoothing using a Savitzky-Golay filter. The smoothed data were thereafter processed into the first derivative, and then finally treated using mean centring.

Principal component analysis (PCA)

The pre-processed spectral data were stastically analysed using Principal Component Analysis (PCA). PCA transforms the correlated original variables into non-correlated new variables which have smaller dimentionality but can explain larger variations of the original data. PCA was conducted using ParLeS software (Viscarra Rossel, 2008). A score plot of the first two principal components, PC1 and PC2, which accounted for the greatest variance of the spectral data, is used to group the soil samples with very low, low, medium or high C and N content.

2.4. Developing calibration models

Partial Least Square Regression (PLSR) (ParLeS; Viscarra Rossel, 2008) was used to develop calibration models between the pre-processed spectral data and the reference analytical data of soil C and N. In order to avoid over fitting, the PLSR models are developed using a number of factors (principal components) that produce low root mean square error (*RMSE*) and low Akaike Information Criterion (AIC). Over fitting may happen when excessively large numbers of factors are applied. The calibration model was tested using one-leave-out cross-valication and using separate validation sample set.

2.5. Parameters for regression model accuracy

The ability of the PLSR model to predict soil C and N was assessed using the following statistics: (i) *RMSE* (root mean square error) of measured and predicted soil C and N, (ii) coefficient determination (R^2), and (iii) *RPD* (ratio of prediction to deviation); *RPD* is calculated as standard deviation of the reference data divided by root mean square error (*SD*/*RMSE*). The best prediction model has the largest *RPD* and R^2, and the smallest *RMSE* in cross validation test or using separate validation test.

3. Results and Discussion

3.1. Soil Carbon and Nitrogen

The summary of selected properties of the soil samples is shown in Table 1. The range (min – max) of soil C and N is narrow, from very low to medium, with no samples containing high C and N. Low content of C and N in this soil is probably related to low return of organic matter and coarse soil texture. High oxidation rate in coarse soil texture tends to reduce the amount of soil organic matter. Moreover, soil with less clay has less ability to protect organic matter from oxidation process. Organic matter can be located among clay particles and thus be protected from organic decomposition.

Table 1. Soil sample properties

Property	Range		Median	Mean	Variance	Standard deviation	Coefficient of variation (%)
	Min.	Max.					
Soil C	0.39	2.28	1.01	1.03	0.092	0.304	29.45
Soil N	0.04	0.26	0.11	0.11	0.001	0.036	31.70

3.2. Soil Spectral Shape

The shape of soil spectral reflectance with very low (< 1% C), low (1-2% C) and medium (2-3% C) amount of carbon is shown in Figure 2. Soil with very low C has higher reflectance at around 750 nm compared to soils with low and medium C, showing brighter colour. Soil with higher C show lower reflectance (darker colour) at around visible band, indicating higher amount of organic matter. Soil with very low organic matter content has shaper angle at around 750 nm, compared to low and medium organic matter content. The same phenomenon was also found by Dematte et al, (2004) and Kusumo et al (2008).

As water (O-H bond) is the strongest absorber in the NIR region, its strong absoption can be seen at around 1400 and 1900 nm (Figure 2). Absorption at around 1400 nm is the first overtones of the O-H bond of water, while absorption at around 1900 nm is the combination of the H-O-H bend and O-H stretching (Clark, 1999). Strong absoption at around 2200 nm is combination of metal O-H bend plus O-H stretch.

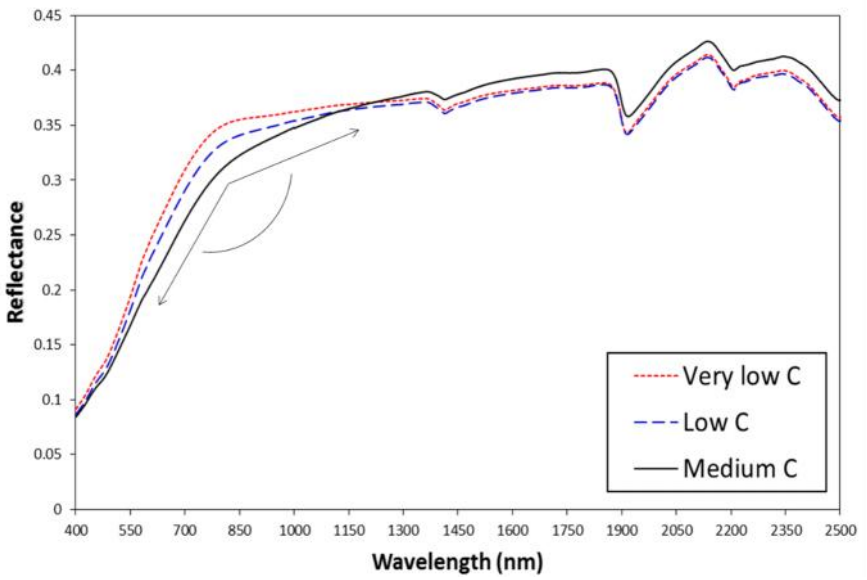


Figure 2. Spectral shape of soils with very low, low and medium amount of carbon.

3.3. Score Plot of Pre-processed Spectral Data

Score plot of the first two principal components was presented in Figure 3. Two dimentional score plot of the first two principal components containing 70.5% spectral variance were not clearly able to separate sample groups with very low (< 1%), low (1-2%) and medium (2-3%) content of C. Some samples of the three groups overlap one each other, although samples with higher C content tend to stay at upper position of quadran 1 and 2.

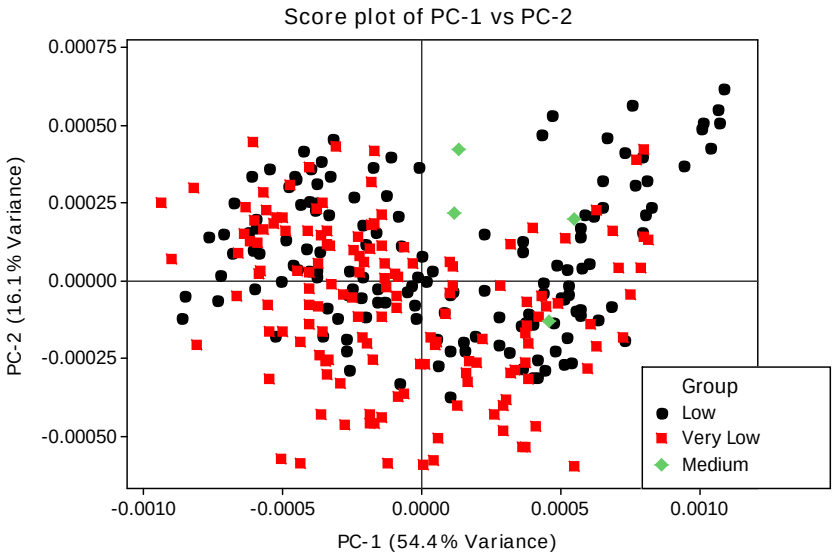


Figure 3. Score plot of the first two principal components which account for 70.5% variance of the spectral data

3.4. Prediction Accuracy of Soil C and N

Prediction values of soil C and N using leave-one-out cross-validation and using separate validation set are shown at Table 2. Prediction of soil C and N using PLSR calibration model produce moderate accuracy (RPD around 2.00). According to Chang et.al. (2001), the prediction values of soil properties with R^2 0.5-0.8 and RPD 1.4-2.0 are considered moderately successful. While Malley et. al. (2004) considered moderate accuracy if the R^2 0.7 – 0.8 and RPD 1.75 – 2.25. Some factors may cause moderate accuracy of near infrared prediction model, such as low accuracy laboratory analisis as the reference data, spectral ourliers or both. Other chromophores (such as water, decomposition level of organic matter, clay and non-clay soil minerals, carbonates, iron oxides, particle size) may aslo influence the accuracy.

Table 2. Prediction values of soil C and N using leave-one-out cross-validation and using separate validation set.

Properties	Prediction values (leave-one-out cross-validation)		
	R^2_{cv}	RMSECV	RPD_{cv}
C Total	0.756	0.151	2.01
N Total	0.753	0.017	2.00
	Prediction values (separate validation set)		
	R^2	RMSE	RPD
C Total	0.763	0.149	2.01
N Total	0.742	0.017	1.98

Note: 10 factors (latent variables) used

Figure 4 shows the relationship between laboratory measured C (and N) and NIRS predicted C (and N). The data show moderate relationship between laboratory and NIRS analysis, with R^2_{cv} 0.75-0.76 and RPD_{cv} 2.00-2.01. Moderately useful measurement using NIRS indicates that this technique may be used to measure and map soil C and N in the Kayangan agriculture development

area North Lombok. Some previous researches also found moderate accuracy of C and N measurement using NIRS technique (Kusumo et al, 2008). The accuracy may be increased by using more sophisticated tools to analyise the samples (as the reference data) so robustness of the calibration model can be improved. The reference data produced using conventional analysis (Walkley and Black for C; Kjedhal for N) might be not optimal to analyse the real amount of C and N total. Those methods have limitation on combusting all forms of C and N in soil. Some forms of C and N might be difficult to digest and still remain in soil in the solid fraction. Some previous researchers reported the the recovery of C and N combustion using those techniques was less then 80%.

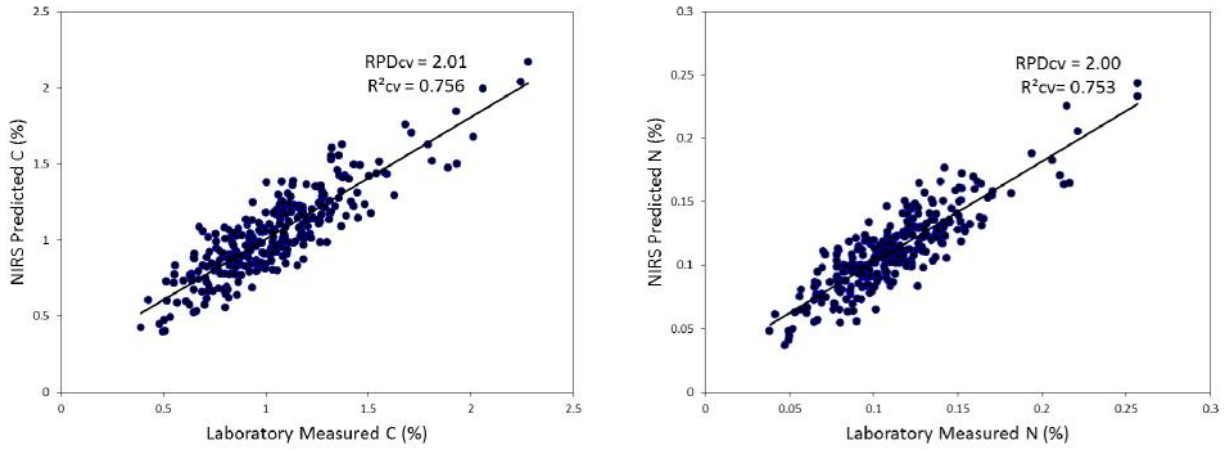
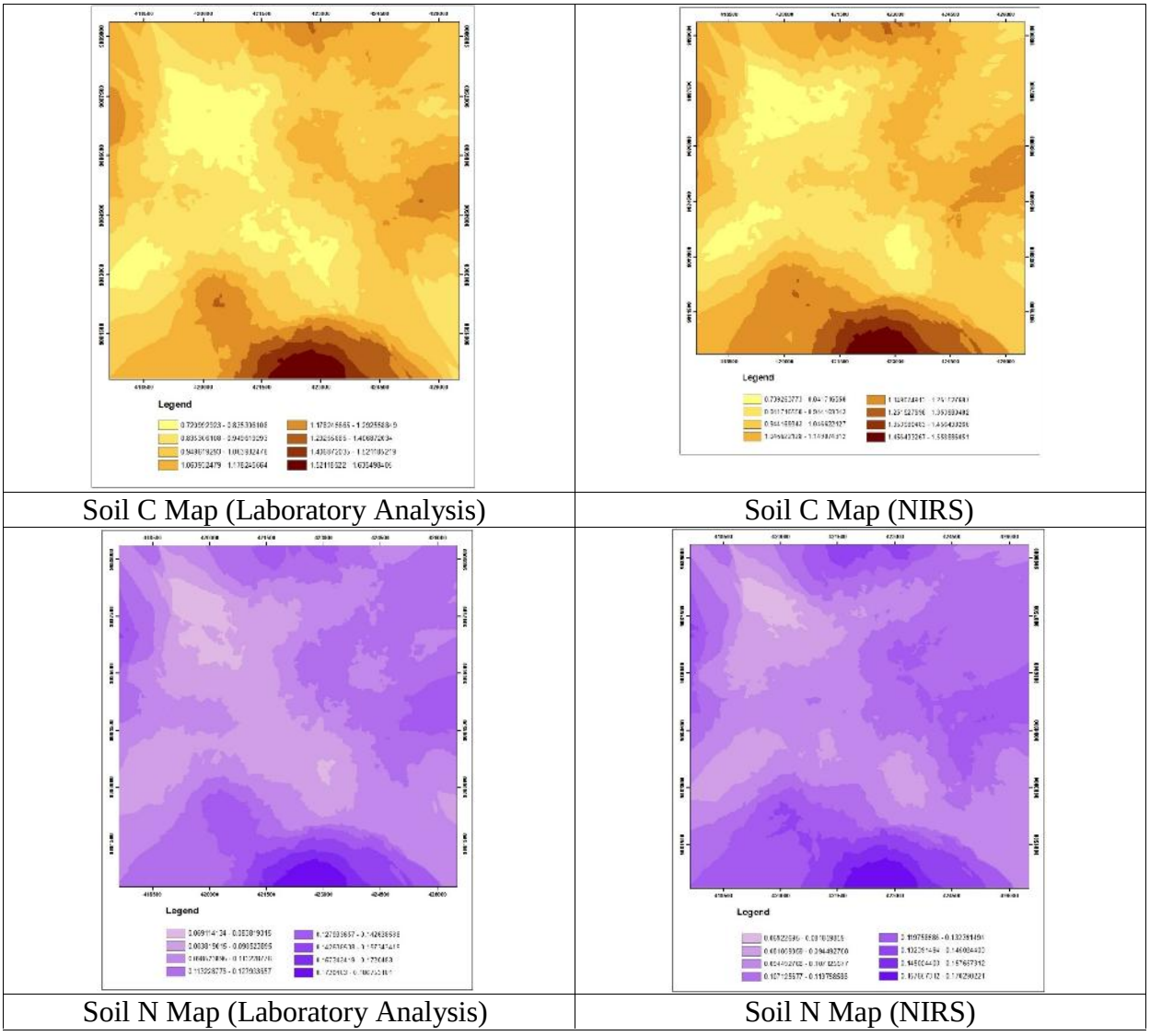


Figure 4. Relationship between laboratory measurement and NIRS prediction of soil C and N.

3.5. Mapping Soil Carbon and Nitrogen

Soil map based on laboratory analysis and NIRS analysis is shown in Figure 5. Although most of the areas contain very low and low soil C, the map can show the degradation of the soil C content from lower (brighter colour) to higher content (darker colour). From the map, it can be said that NIRS technique is useful for rapid measuring and mapping of soil C and N. Rather than spending very high cost for mapping soil C and N using standard expensive laboratory analysis, it may be more useful to safe the cost although the accuracy of NIRS technique may sometimes as not excellent as standard laboratory analysis. Using NIRS, we can scan many samples from more dense sites with shorter distance of sample collection. From this method of sample collection we can produce better detail soil C (and N) map.

The succesfull effort of measuring and mapping soil C and N using NIRS technique will give benefit to other purposes. The map will be useful for site specific management including site specific fertilization. By having soil C and N map, the recommended fertilizer can be applied on the right places, where the area with low C and N should be added more organic matter and N fertilizer, and in the area with high C and N it should be added low organic matter and N, or it might be not temporarily needed additional fertilizer.



Soil C Map (Laboratory Analysis) | Soil C Map (NIRS)

Soil N Map (Laboratory Analysis) | Soil N Map (NIRS)

Figure 5. Distribution of soil carbon content on the study area of Kayangan North Lombok, Indonesia.

4. Conclusion

Near infrared spectroscopy technique was able to measure and map soil C and N di Indonesian Tropical Soil in Kayangan Area North Lombok with moderate accuracy. This technique is considered rapid because no chemicals needed and the process of scanning is very fast. The ability of this technique to map soil C and N may give benefit for site specific management including site specific fertilization which in turn may apply recommended fertilization and avoid excessive use of fertilizer. The accuracy of the PLSR model should be tested using reference data of soil C and N analised using dry combustion technique (such LECO or Elemental Analysis).

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Correlation Between Waist/Hip Ratio And Lipid Profile Of Lactovegetarian Community In West Lombok

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Abstract

Central obesity and dyslipidemia are the risks of metabolic syndrome. Waist and Hip (W/H) ratio is early screening to diagnose of central obesity. Vegetarian diet decreased the risks of metabolic syndrome. Aim of this study was to find out the correlation of waist and hip ratio and lipid profile of lactovegetarian community in west Lombok. This research design was cross sectional study involving all community of lactovegetarian in west Lombok. There were 29 member of lactovegetarian community involved in this study. Antrophometric assessment conducted to find out W/H ratio and blood sample taken to assess lipid profile. Correlation of W/H ratio and lipid profile analysed by using Pearson correlation. The result for correlation of W/H ratio and lipid profile W/H ratio and cholesterol did not correlated (p 0.887) W/H ratio and triglyceride (p 0.632) W/H ratio and HDL (p 0.978) and W/H and LDL (p 0.862). That result can be concluded that W/H ratio did not correlated with lipid profile of lactovegetarian community.

Keywords*: vegetarian, antrophometric, waist/hip ratio, lipid profile*

1. Introduction

Vegetarian diet tends to be more popular all over the words, including Indonesia. In 1997, 1 % of American population were vegetarians, and in 2006 they were increased to 23 % of all population [1]. In India, more than 50% of population were vegetarian in 2003 [2]. Indonesia Vegetarian Society (IVS) documented that there are 5000 vegetarian in 1998 and these number were raised in 2007 to be 70.000 of vegetarian participants. In West Nusa Tenggara (WNT) vegetarians did not well-documented, IVS noted that most of vegetarian in WNT were lacto-vegetarian and lacto-ovo vegetarian [3].

Vegetarian diet has decreased the risk of some diseases such as hypertension, type 2-diabetes mellitus, cancer and metabolic syndrome [4] [5] [6]. Metabolic syndrome was syndrome which was including obesity, dyslipidemia, hyperglycemia and hypertension. This syndrome increased the risk of type 2- diabetes mellitus and cardiovascular disease [7]. Prevalent rate of metabolic syndrome was 15-30 % all over the world and the highest was in developing country [8] .

Diet is one factor that affected the risk of metabolic syndrome [9] [10]. Study conducted by Adventist Health Study in America and Canada showed that vegetarian diet decreased risk of metabolic syndrome [5]. Study conducted by Diah [11]on vegetarian in Yogyakarta, Semarang and Surabaya indicated that the risk of metabolic syndrome of vegetarian vegan was not different significantly to difference vegetarian non vegan.

Some studies showed that metabolic syndrome increased by central obesity, while metabolic syndrome consist of dyslipidemia. Since the lactovegetarian has restricted in animal product diet, so that they consumed low containing fat. This condition would affected lipid profile of this community. The aimed of this study was to find out the correlation between WHR and lipid profile in lactovegetarian community.

2. Material and Method

2.1. Study Design

This research was an observasional research using cross sectional study design. All parameters namely interview, antrophometric measurement (waist circumference and hip circumference) and lipid profile assessment conducted in one period of time. Dependent variable of this study was lipid profile, while independent variable was waist/hip ratio This study were taken place in lacto vegetarian community in Gerung district in July and August 2015.

2.2. Research Participants

Participants in this study were the member of lacto vegetarian community which fulfill inclusion and exclusion criteria. Inclusion criteria were: member of lacto vegetarian community, agree to participate by signing informed consent, aged 18-64 year old. Exclusion criteria were: active smoker, alcohol consumption, pregnant, refuse to participate. Minimal sample size calculation by using proportion formulation found that number of minimal sample was 30. From 45 member of lactovegetarian community 30 member were enrolled and one person was excluded because of the age was under 18 year old.

2.3. Research procedure

Following the signing of informed consent, participants underwent research procedure. Waist circumference was measured by using WHO antrophometric guideline, that was in the midle of the line between arcus costae and crista iliaca and hip circumference was on m. gluteus maximus. Ratio of waist circumference and hip circumference then categorize into central obesity or not. Afterwards, 5 ml of blood sample were taken from v. mediana cubiti then spill out from disposable spuit into plain sample tube (non-EDTA tube) to got blood serum. Serum then assessed for lipid profile by using automatic hemoanalyzer and the value was stated in mg/dL.

3. Result and Discussion

The result of this study was as follows:

Table 1. Participants characteristic of W/H ratio and lipid profile

Characterictic of participants	Value (mean±SD)
Waist to hip ratio	0.84±0.05
- Male	0.85±0.06
- Female	0.83±0.05
Lipid profile	
Triglyceride	176±128 mg/dL
- Male	201±157 mg/dL
- Female	156±100 mg/dL
Cholesterol	165±38 mg/dL
- Male	164±39 mg/dL
- Female	167±39 mg/dL
HDL	41±12 mg/dL
- Male	39±12 mg/dL
- Female	42±14 mg/dL
LDL	
- Male	92±35 mg/dL
- Female	84±46 mg/dL

The participants features from table showed that mean of W/H ratio was in normal limit, either male or female were not suffered from central obesity (male <90 cm and female <85 cm). Triglyceride value for male was higher than normal value. HDL value either male dan female were lower than normal value, while LDL and cholesterol within normal limit.

Since data were normal distribution statistically, so that appropriate statistical analysis for correlation testing was Pearson's correlation test. The Pearson's test result as below:

Table 2. Correlation between W/H ratio and lipid profile

	Pearson's Correlation (p,ρ)			
	Triglyceride	Cholesterol	HDL	LDL
WHR	0.289;0.204	0.352; 0.179	0.583;0.106	0.999;0.000

Table 2 demonstrated that W/H ratio was not correlated significantly to triglyceride, cholesterol, HDL and LDL in lactovegetarian community. Waist/Hip ratio is one parameter which is useful to describe central or abdominal obesity in the population. Compare to all anthopometric measurement, W/H ratio was a sensitive parameter to assess the risk of cardiovascular diseases [12]. Based on the result of W/H ratio (WHR)of lactovegetarian population in West Lombok, founded that the risk of cardiovascular disease was lower than normal population since WHR value was lower than normal population, male <90 and female <85 (WHO, 2011). Regarding to this reference value 92 % of the lactovegetarian population had normal WHR, that meant this population has mild cardiovascular risk [12] (WHO, 2008). Study by Czernichow, et al (2011) [13] demonstrated that WHR was the best predictor of cardiovascular risk compared to other antropometric parameter in diabetes mellitus population and it could describe value of VLDL and LDL, the larger of WHR and the larger of VLDL and LDL value. The result of this research was different from Czernichow. Life style and underlying disease of the population affected lipid profile of the population.

Lipid profile which consist of triglyceride, total cholesterol, LDL and HDL in this study were not correlated to waist and hip ratio in lactovegetarian population. This result was the same as found by Gandhi, et al, 2014[4]; Chaudri et, al. 2013 [15]; Jian et al, 2014 [16]; Verma, et at. 2015 [17]; Huang, 2014 [18].

4. Conclusion

Conclusion of this study was WHR in lactovegetarian community in West Lombok was normal and also most of lipid profile within normal limit, except HDL value was lower than reference value. WHR did not correlated to lipid profile in lactovegetarian community in West Lombok.

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Isolation of Andrographolide from *Andrographis paniculata*

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Abstract

Andrographolide has been isolated from the methanol extract of *Andrographis paniculata*. Isolation is done by maceration and recrystallization. Isolated andrografolida used this method that has high amount (> 5% of the total extract). Andrografolida are identified using spectrum data of NMR, IR, and UV. Andrographolide can be further utilized for natural product material for synthesis, bioactivity studies, or chemotaxonomic studies. Andrografolida has been produced in large quantities and commercialized through the Calon Perusahaan Pemula Senyawa standar Indonesia (CPPBT-SSI) cooperation of Ristekdikti with Mataram University.

Keywords: *Isolation, andrographolide, Andrographis paniculata*

1. Introduction

Secondary metabolites are organic compounds derived from plants that produced not through the main metabolic pathways (Hakim, 2016). In general secondary metabolites have bioactive activity. Secondary metabolites are tasked to protect plants from pests and diseases, both from the plant itself or the surrounding environment. Secondary metabolites is only produced in small amounts. Some examples of classes of compounds that are included in the category of secondary metabolites namely terpenoids, steroids, polyketides, phenyl propanoid, flavonoids, and alkaloids (*Hakim, et al., 2016a*). The main characteristics of secondary metabolites found in plants namely (1) have ecological functions like towing insects, protective, tools to compete, hormones, (2) unevenly distributed in every organism, (3) physiology activity related to chemical structure and relationships between structure.

Isolation of secondary metabolites from medicinal plants examined in natural product laboratory (Hakim, *et al*., 2016b). Generaly isolation of secondary metabolites consists of extraction, fractionation, purification, and elucidation stucture of secondary metabolites. The same secondary metabolites from a plant species can be isolated in a various ways, so there is no standard procedure to isolate the secondary metabolites of a plant species. These isolation activities provide opportunities for students to design their own experiment (*Hakim, et al., 2016a*). The discovery of secondary metabolites isolation procedures are simple and inexpensive will provide opportunities availability of secondary metabolites in significant amounts. In this article will describe the isolation procedure andrographolide from A*ndrographis paniculata*.

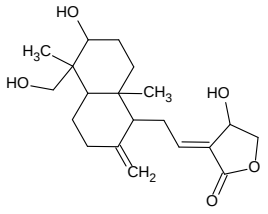

Figure 1. Structure of andrographolide

1.1. *Andrographis paniculata*

Andrographis paniculata Nees. (Bitter) is the annual plant that belongs to the family Acanthaceae (Sulistijo and Pujiasmanto, 2007). *A. paniculata* are upright, grows naturally in lowland areas to a height of ± 1600 m above sea level. *A. paniculata* are grown in a variety of habitats, such as the suburbs of fields, gardens, or forests. The main components of *A. paniculata* is andrographolide useful as medicine. In addition leaf of *A. paniculata* contains saponins, tannins, flavonoids (Taiz and Zeiger, 1991). Other chemical constituents present in the leaves and stems of *A. paniculata* are lactone, paniculin, and calmegin. Traditionally *A. paniculata* has been used for the treatment of snake or insect bites, fever, dysentery, rheumatism, tuberculosis, gastrointestinal infections, and others. *A. paniculata* is also used for antimicrobial/antibacterial (Yusron *et al.*, 2005).

Currently *A. paniculata* widely studied to be developed as a raw material of modern medicine, including the use of bitter as infection medicine. *A. paniculata* widely used topically as skin infections, rashes, sores, mange, open wounds and minor burns light. In addition *A. paniculata* is also widely used to treat of diabetes. All parts of *A. paniculata* such as leaves, stems, flowers and roots was eaten or boiled to drink (Pujiasmanto, *et al*., 2007). The bitter taste is caused by the presence of andrographolide compounds that are numerous in the bitter plant especially in the leaves and stems. Andrographolide content in the leaves of 2.5 to 4.8% of the dry weight *A. paniculata*. Andrographolide is a diterpene lactone compound and soluble in organic solvents (Srijanto *et al*., 2012).

Andrographolide has many benefits in health. Andrographolide has a variety of pharmacological activities such as lowering blood sugar levels, triglycerides, and LDL, anti-inflammatory, antioxidant, and analgesic. In addition Andrographolide also used as an antibacterial (Wardiatini *et al*, 2014). This article will discuss the method of isolation andrographolide effectively and inexpensively.

2. Result and Discussion

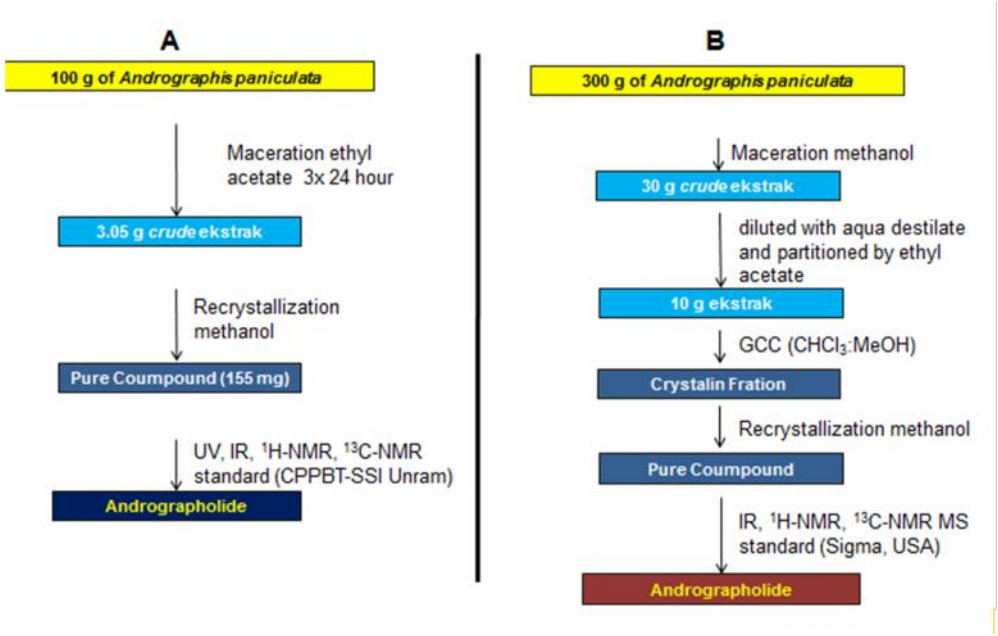

Figure 2. Comparison of isolation procedure of andrographolide

A = This reseach, B = Sukardiman *et al.*, (2007)

The used materials in this study consist of the andrographolide standard (CPPBT-SSI Mataram University), leaf of *A. paniculata*, ethanol, n-hexane, ethyl acetate, distilled water, methanol and TLC plate. The used tools in this study consist of a set of tools of maceration, filter paper, rod, plate, and a rotary evaporator.

A total of 100 gr of powder *Andrographis paniculata* was macerated with ethyl acetate 3x24 hours. Obtained extract were collected and evaporated with a rotary evaporator until it is condensed extract (3.05 g). Viscous extract were then recrystallized using hot methanol several times to obtain a yellowish white crystal (155 mg). These crystals were tested for purity using three systems eluent namely ethyl acetate: acetone (8: 2) (Rf = 0.7); chloroform 100% (0.6); ethyl acetate 100% (0.5). The structure of pure isolated coumpond were determined based on the spectroscopy data like NMR, UV, IR and confirmed using andrographolide standard (CPPBT-SSI Mataram University) by TLC standards and isolates on the same TLC plate and taking the value of the standard and isolates Rf spot. The results of spectroscopic data and Rf standard compound showed that isolated coumpound was andrographolide.

Isolation procedures of andrographolide from *A. paniculata* previously been published by Sukardiman et al. (2007). Comparison of andrographolide isolation procedures performed in this study and reference (Sukardiman *et al*., 2007) is shown in Figure 2. It is seen that Sukardiman et al. (2007) procedures of isolation of andrographolide from *A. paniculata* in six steps, whereas isolation procedures performed in this study through four steps. Sukardiman et al. (2007) conducted a total extract fractionation using Gravity Coloum Chromatography (GCC) using $CHCl_3$:MeOH as eluent. Results of fractionation was purified using recrystallization with methanol to produce andrographolide. On the other hand this study directly was recrystallization of total extract of *Andrographis paniculata* using hot methanol to produce andrographolide. Based on the above explanation andrographolide isolation procedures performed in this study is simpler than the andrographolide isolation procedure been published previously (Sukardiman *et al*., 2007). Isolated andrographolide used procedures performed in this study that has high amount (> 5% of the total extract). Andrographolide can be further utilized for natural product material for synthesis, bioactivity studies, or chemotaxonomic studies. Andrografolida has been produced in large quantities and commercialized through the Calon Perusahaan Pemula Senyawa standar Indonesia (CPPBT-SSI) cooperation of Ristekdikti with Mataram University.

Acknowledgements

We wish to thank Direktorat PPBT, Kementerian Riset, Teknologi, dan Pendidikan Tinggi for financial support of this research in CPPBT programe No 32/PPK/F4/PKS.CPPBT/IX/2016 and No: 316.A/SPP-CPPBT/UN18.12/PL/2016.

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The Use of 1-Mcp: Overview Several Studies on The Postharvest Quality of Selected Fruits

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Abstract

Several studies in using 1-methylcyclopropene (1MCP) to the postharvest quality of some selected fruits have been done within 2010-2015 period at some different places. 1-MCP has effectively inhibited the production of ethylene and maintained the firmness on 'Royal Gala' apples stored at controlled atmosphere for 4 months; suppressed the carbondioxide on 'Cavendish' bananas for 8 days under controlled atmosphere storage; and maintained the firmness on 'Kayu' and 'Raja' bananas at ambient temperature.

Keywords: *1-methylcyclopropene, carbondioxide, ethylene, firmness*

1. Introduction

1-methylcyclopropene (1-MCP), an inhibitor of ethylene perception, is increasingly used to improve storage potential and to maintain quality of vegetables and fruits (Curry, 2008; Watkins, 2008). 1_MCP shows promise as commercial control of ripening and senescence of harvested fruits and vegetables (Boonyarithongchai et al., 2010; Watkins, 2008). Overview several studies using 1-MCP on the postharvest quality of selected fruits is the objective of this research.

2. Materials and Method

2.1 Apple

'Royal Gala' apples harvested at three different maturities were treated with 1 ppm of 1-MCP for 15 hours and were stored for 4 months under CA storage. Quality assessment was done at day 1 and day 7 after storage.

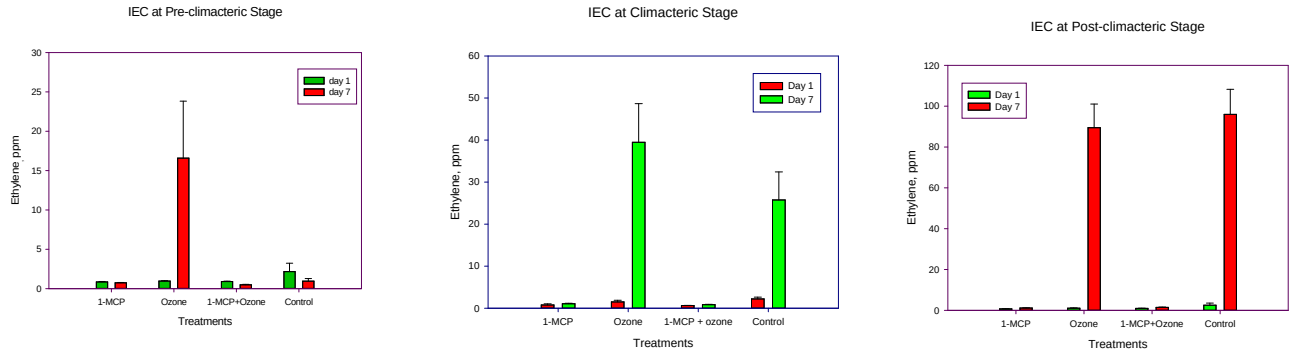
2.2. Banana

'Cavendish' bananas were treated with 350 ppb of 1-MCP for 18 hours and were stored for 11 days under CA storage. The CO2 production were assessed everyday during storage.

'Raja' and 'Kayu' bananas harvested at three different maturities were treated with 0.1114 gram of 1-MCP for 20 hours and stored for 7 days at ambient temperature. Quality assessment was done at day 1, 5 and 7.

3. Results and Discussion

3.1 'Royal Gala' Apples



A B C

Figure 1. A: The internal ethylene concentration (IEC) for day 1 and day 7 after storage at pre-climacteric stage; B: The internal ethylene concentration (IEC) for day 1 and day 7 after storage at climacteric stage; C: The internal ethylene concentration (IEC) for day 1 and day 7 after storage at post-climacteric stage.

Results showed that 1-MCP effectively hampered the internal ethylene production (IEC) during storage at all maturity stages at day 1 after storage and continued to day 7 after storage.

3.2. 'Cavendish' Bananas

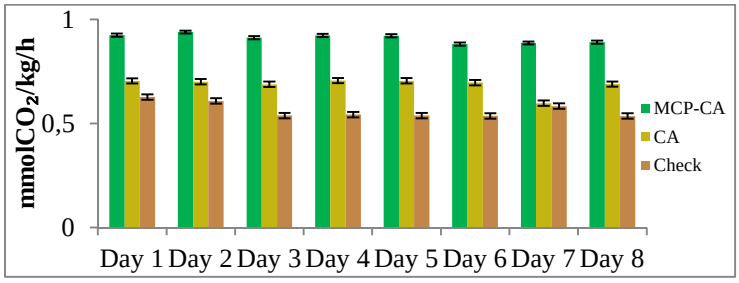


Figure 2. The CO_2 production for all treatments during storage.

As shown on figure 2,treatment with 1-MCP effectively increased the production of CO2 which lead to the ability of 1-MCP to delay ripening on bananas.

3.3. 'Kayu' Bananas

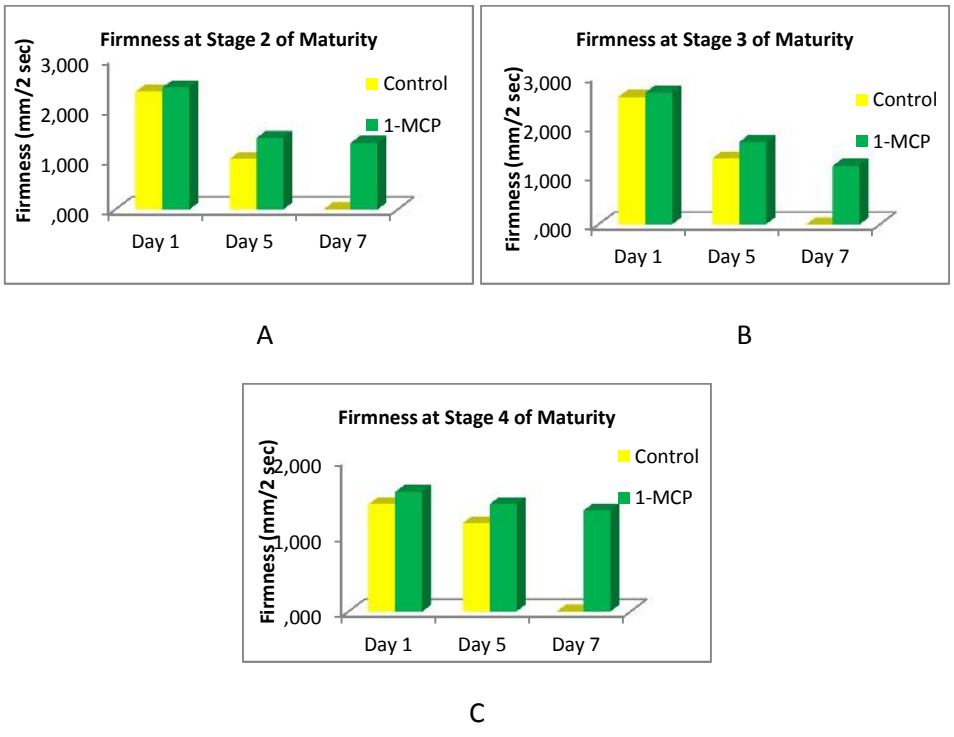
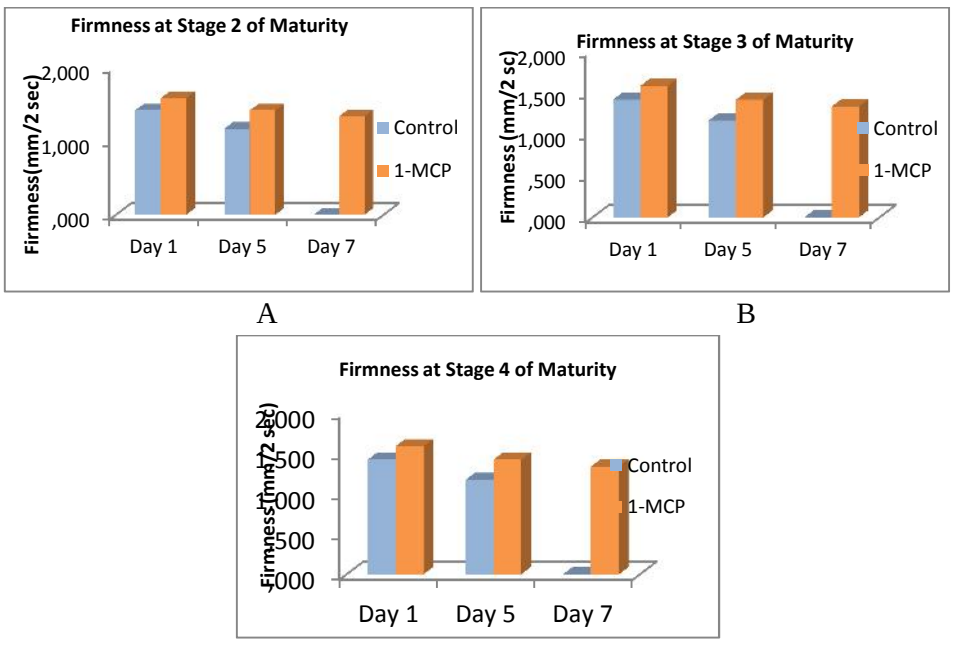


Figure 3. A: Firmness at day 1, 5, and 7 at stage 2 of maturity; B: Firmness at day 1, 5, and 7 at stage 3 of maturity; C: Firmness at day 1, 5, and 7 at stage 4 of maturity.

The use of 1-MCP on 'Kayu' bananas maintained the firmness better than untreated fruits at all stages of ripening.

3.4. 'Raja' Bananas



C

Figure 4. A: Firmness at day 1, 5, and 7 at stage 2 of maturity; B: Firmness at day 1, 5, and 7 at stage 3 of maturity; C: Firmness at day 1, 5, and 7 at stage 4 of maturity.

Figure 4 also showed the similar results that the use of 1-MCP on 'Raja' bananas maintained the firmness better than untreated fruits at all stages of ripening.

4. Conclusion

1-MCP not only inhibited the ethylene and CO_2 production, yet also maintained better firmness during and after storage on several selected fruits

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Design Of The Measuring Instrument Of Turbidity Level Using Turbidity Sensor Based on SMS Gateway

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Abstract

Ideal clean water must meet the water quality requirements which have been given by government. The presence of contaminants / impurities can cause turbidity and disturb water quality. Measurement of turbidity levels are generally still conventional in certain period. Therefore, the device which capable to measure turbidity level in real time and continuously are needed. This study aimed to design a turbidity level device based SMS gateway and find out the testing result of the device. The method used is hardware design using ATmega328 microcontroller on the Arduino Uno module. The components used are GSM Shield module to send SMS information, data logger system which is equipped with a RTC (Real Time Clock) for data storage along with time data information, and Turbidity Sensor TSD-10 as a detector. Whereas the design of software used Arduino IDE software as editor. The calibration process is done by comparing the value of the standard measuring instrument with value of sensor readings. It aimed to get linearity equation which will be used in the unit conversion process.

Keywords : *turbidity, SMS gateway, turbid meter, turbidity sensor*

I. Introduction

Water is one of the very important natural resource in the world. Water is a major component in the process of living creatures. Water is needed by living things not just to meet daily needs, but also as a means of transport, for industrial use, as a source of energy, agriculture and other purposes. Based on the role that is vital for life, then the required availability of water in good condition, both quality and quantity. The water is of poor quality will have an impact on the environment and the health of humans and other living things. The decline in water quality will degrade efficiency, productivity and the carrying capacity of water resources. Water pollution is generally derived from domestic sources and non-domestic sources. These pollutants affect water quality and cause turbidity in water.

Turbidity (turbidity) is a state where a liquid is reduced transparency due to the insoluble substances (ISO 1999). There are three aspects that affect turbidity, including aspects of physical, chemical and biological aspects aspects. Water turbidity level will generally be determined by the amount of NTU (nephelometric turbidity units). Magnitude turbidity of drinking water that meets the health requirements applicable by reference is not more than 5 NTU and not perceivable turbidity of the water will not be seen.

One standard test equipment to determine the level of turbidity is Turbidimeter. This tool is already common and easily searchable. But the price is relatively expensive, so only certain parties who have it. The design of the measuring instrument turbidity levels have also been carried out by some previous researchers. However, only limited research conducted to determine the level of turbidity and not many are using communications-based information systems.

This is why the authors to design a tool instrumentation capable of measuring the

level of water turbidity effectively and accurately using the Turbidity Sensor-based SMS Gateway and to know the test results of these sensors. In this study, the testing process is done with a case study on the Ancar river, in Mataram .

2. Theory

2.1. Turbidity sensor type TSD-10.

This sensor measures the amount of light coming from a light source (diode) to the light receiver (phototransistor) in order to calculate the water turbidity level.

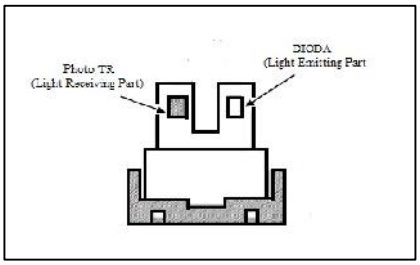

Figure 1.1 Parts of turbidity sensor (Source: www.ge-mcs.com)

There are two main components of the sensor circuit that changes the light intensity of the phototransistor and a light emitting diode (LED). Phototransistor generates a current in the base area. Countercurrent to the phototransistor is controlled by the amount of light or infrared received. While the LED is a semiconductor PN junction that emits light when fed forward Retainer . N-type semiconductor has a number of free electrons. While the P-type semiconductor has a number of free holes. If the N and P type semiconductors will be connected to form an energy barrier (junction) (Wahyudi, 2012).

2.2. Mikrokontroler Atmega 328

Arduino Uno is a microcontroller-based ATmega328 is a platform that is open source. Arduino has managed to write a program, compile it into binary code and upload it to the microcontroller memory.

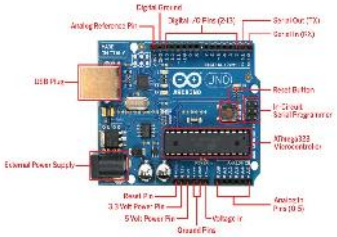

Figure 1.3 Arduino uno (Source: www.arduino.cc)

2.3. Icomsat GSM/GPRS Shield

Icomsat is a GSM / GPRS shield arduino whose main components are SIM900 Quad-band GSM / GPRS module. The use of this Icomsat done via AT commands (AT commands), and can be integrate with Arduino / Iteaduino and Mega. Arduino to communicate and send commands to the GSM shield through serial communication.

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Figure 1.4 Icomsat GSM / GPRS Shield (Source: www.arduino.cc)

To be able to connect to the Internet network, Icomsat require the current GSM cards. APN settings, username and password entered on the card arduino sketch. Arduino and GSM shield can perform two-way communication, providing data on GSM arduino shield to be sent and GSM shield provide response data to arduino.

2.4. RTC (*Real Time Clock*)

Real Time Clock (RTC) serves as an information provider time (date and time) for the microcontroller. Time data is transferred from the RTC to the microcontroller via I2C interface. RTC can count the seconds, minutes, hours, day, date, month and year are valid until 2100.

Figure 1.5 RTC module (Source: www.sfe-electronics.com)

3. Methods

System design in this study consists of two parts, namely the design of the system hardware and software system design.

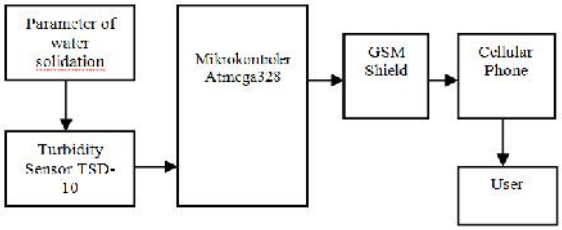

Figure 2.1 The flow of the whole system work process

3.1. Hardware Design Techniques

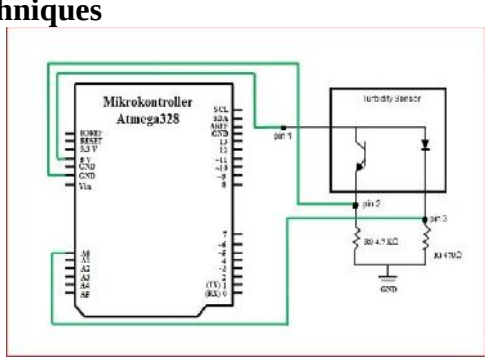

Figure 2.3 Hardware design tools

3.2. Mechanical Design Software

Software design is done by making use software Sketch arduino Arduino IDE shown in Figure 2.4.

3.3. Mechanical Testing Equipment

The samples are orange solution made with different concentrations, namely 7.5%; 10%; 12.5%; 15%; 17.5%; 20%; 22.5%; 25%; and 27.5%. In this process, the sensor displays the results in the form of voltage values with the unit mV. The results obtained will be compared with the results of measurements using standard tools Turbidimeter in units of NTU. From the comparison results will be obtained graph the linearity between the value of the voltage (mV) and turbidity (NTU), and the regression equation

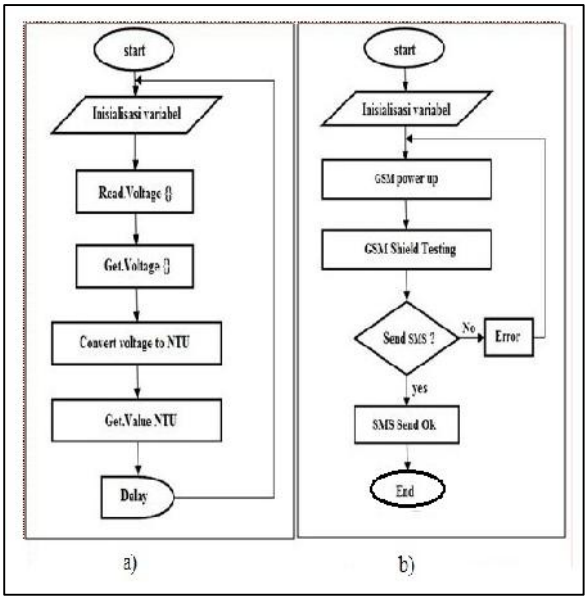

Figure 2.4 Flow Chart of the system, a) flow chart data system, b) flow charts GSM Shield

3.4. Mechanical Calibration

The calibration process is done by comparing the measurement results with the level of turbidity Turbidimeter standard tools and tools in the wake. The results obtained are the sensitivity values. Because the second unit of measurement tools are different, the data processing is done to determine the regression equation which could then be used as a reference for conversion into an NTU. Following the transfer function is generate

$$y = a + bx \qquad (2.1)$$

3.5. Data Retrieval Techniques

The data retrieval process starts by uploading a program using the Arduino software. The program gives a chance to send information via SMS (Short Massage Service). Data taken at 5 points Ancar Mataram river region.

4. Results and Discussion

A. Results of System Design

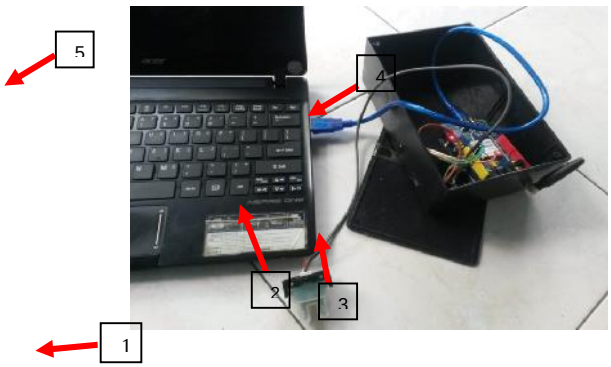

Figure 3.1 overall tool set consisting of 1) Turbiditi Sensor, 2) GSM Shield and Arduino, 3) Antenna, 4) cable downloader, 5) PC .

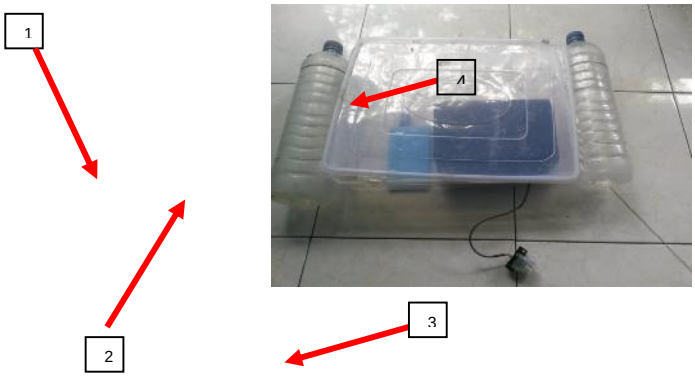

Figure 3.2 System measuring tool is ready tested, 1) power bank, 2) system tools, 3) Turbidity Sensor, 4) buoys

4.2. System Testing Results

The testing phase system is divided into two, namely Turbidity sensor testing and system testing SMS Gateway

1) Testing Results Turbidity Sensor TSD-10

a. Calibration Unit Con

Table 3.1 Results of measurement using a turbidimeter and turbidity sensors

concentration solution (%)	Turbidimeter (NTU)	Sensor (mV)
7,5	169	3440,86
10	221	3391,98
12,5	293	3225,81
15	359	3103,62
17,5	447	2971,65
20	517	2903,23
22,5	605	2771,26
25	668	2595,31
27,5	711	2580,65

From the data in Table 3.1 regression equation which could then be used as a reference

for conversion into an NTU.

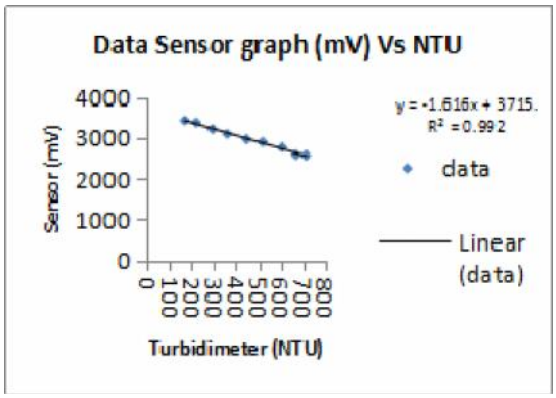

Figure 3.3 Graph linearity of the relationship between the results Turbidimeter (NTU) with the results of sensor readings (mV)

4.3. Measurument Result

After Satun converted into NTU, remeasurement do untu determine the level of accuracy of the sensor determines the values of the relative error of the measurement results. In terms of percent errors, accuracy defined by equation (4.2). The results obtained after the conversion are as follows:

Table 3.2 Data after conversion unit into NTU

Concentration solution (%)	Turbidimeter (NTU)	Sensor (NTU)	% Error
7.5	169	210.86	24.77
10	221	259.81	17.56
12.5	293	333.24	13.73
15	359	409.73	14.13
17.5	447	483.16	8.09
20	517	550.48	6.48
22.5	605	608.61	0.60
25	668	669.8	0.27
27.5	711	718.75	1.09
Average			9.35

From these data it can be seen that the tool design has an average relative error of 9:35%

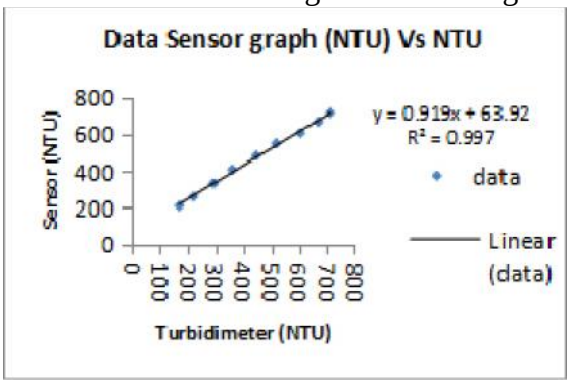

Figure 3..4 Graph linearity of the relationship between the results Turbidimeter (NTU) with the results of sensor readings (NTU)

4.4. SMS System Testing Results

Figure 3.5 The test result GSM Shield

From the testing that has been done can be seen that the tool's ability to send SMS is the same as the range of GSM cards are used. SMS communication can reach a larger area because the GSM network has been spread in Indonesia, even in remote areas

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Overall System Testing Results

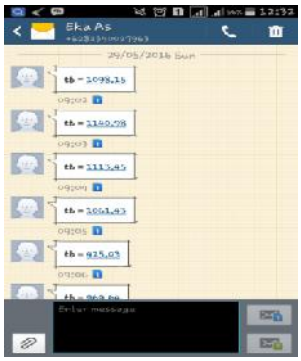

Figure 3.6 The form of SMS received by the user

The process of data collection is done at five points in the watershed Ancar, Mataram. Data collection was performed for 20 minutes at each point with 1 minute delay. Here is the average value of the measurement results of the turbidity level at each point.

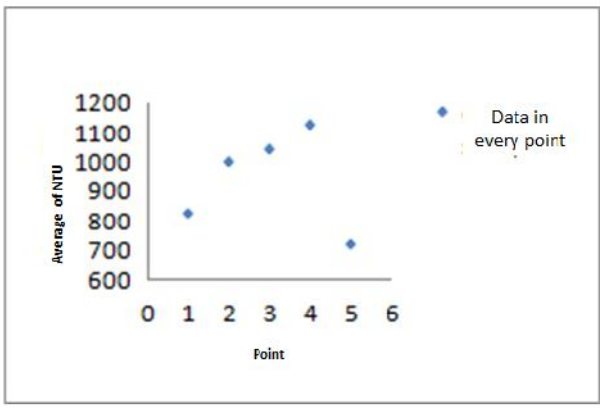

Figure 3.7 Graph of the average measurement results in every point

In theory, if there are no external factors, a river flows downstream or estuary would be more turbid than the upstream area and the center. From the data obtained in this study,

data from point one to point four are in accordance with the theory. However, the data point to a five decreased. This is because the turbidity sensor is very sensitive to light it receives. The intensity of light in the estuary downstream or greater than the upper and middle areas. As a result, the intensity of light received by the sensor is larger than the barrier material or dissolved materials, so that the sensor assumes that the water is clear.

5. Conclussion

The system uses turbidity level measuring instruments Turbidity Sensor-based SMS gateway has been successfully created and is composed of hardware and software devices. The hardware device consists of arduino uno, GSM shield, RTC, GSM card and Turbidity Sensor. Device Software consists of software arduino IDE. The system uses turbidity level measuring instruments Turbidity Sensor-based SMS gateway has been able megukur turbidity levels with an average relative error of 9.35% and is capable of sending SMS as informassi system to the user. Results obtained at each point (1-5) is 822.9; 998.2; 1040.3; 1123.5; and 718.4 in units of NTU

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The Identification of Agroforestry System Plants As Raw Ingredients/Materials for Herbal Soap in Sesaot Forest

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Abstract

"Back to nature" lifestyle is start to develop inthe middle to highclass society.The awareness of the use of herbal ingredients increasing, considering the many risks of the use of chemical ingredients.Sesaot forest area grown and planted by Agroforestry people. The methods that have been used are exploration and description. The research of the plant's identification as raw materials for herbal soap in Sesaot Forest Area, West Lombok, has been done in June-July 2016. The objective of this research is to determine the species of plants as herbal soap's material that grow in the Sesaot Forest Area. The dominant vegetations that can be used as raw material for herbal soap are coconut (*Cocos nucifera* L.), candlenut (*Aleurites muloccana* (L.) Willd.), avocado (*Persea americana* Mill.), coffee (*Coffea canephora* Pierre ex A.Froehner), cacao (*Theobroma cacao* L.), piper (*Piper betle* L.), saffron (*Curcuma longa* L.) and yellow campaka (*Magnolia champaca* (L.) Baill. ex Pierre).

Keywords*: identification, herbal soap's raw ingredients, Sesaot Forest Area*

1. Introduction

Indonesia has a high biodiversity plants, many of them are used for cosmetics, medicines and soap materials. People prefer the herbal soap because of the bioactive compounds contained in it are relatively suited better to the skin. The soap is mixed with active ingredients that can be directly extracted by distillation process to get the essential oil.

Nowadays, the resource of soap's raw material are from forests, either from natural forest, community forests, or state forests that managed by communities (HKm). Forest management system, both in the community forest or KPH are using agroforestry systems.

The implementation of HKm program prioritized in the less productive areas, have a high accessibility, and community dependence to the forest is relatively high. Comprehensive development in West Nusa Tenggara (NTB) province until 2000 reached 35.000 ha which spread in some regencies include Sumbawa, Dompu, Bima, East Lombok, Central Lombok and West Lombok (Masnun, 2009).

The Community forests in West Lombok Regency who hadalicense of Alternative Community Forest (IPHKm), covers 185 ha area which spread over three villages namely, Sesaot village, Lembah Sempage village and Sedau village located in Narmada District.Sesaot protected forest is one of the forests which managed by agroforestry system community with community-based forest management schemes, in order to increase people's income and environment preservation since 1995 (Mansy, 2009).

Community forests which located in Sesaot are located outside of the State forests area. The structure and composition are similar to HKm forest using agroforestry systemwith combination of agricultural corps and trees. The community forests are generally located around the yard, so there are also lot of plants bio diversity, mainly used as a house decoration, and flowers as the ingredients of essential oil.

Sesaot forest area is a forest protectedarea that gives the consequences to not cutting the trees in HKm areas and to minimalize the over logging in community forest area, considering that the area is a conservation zone in Jangkokhead watershed. To increase incomes of the people in that area is to utilize the non-timber forest product. Potential as HHBK has been done but the specific benefits not been done, that's why they identifythe non-timber forest plants that have potentials as raw materials for soap. The purpose of this research is to determine the types or species of the plants that grows in HKmSesaot area and community forest that can be used as raw materials for herbal soap also to know the dominant species that cultivated by the community.

2. Materials and Methods

This research was conducted in June-July 2016. The research located in Sesaot forest area i.e. Buwun Sejati, Sesaot, Pakuan, Lembah Sempage dan Sedau Village which is inJangkok head watershed, district of Narmada, West Lombok Regency. The production of herbarium and specimen identification have been done in Laboratory of Silviculture and Technology of Forest Products, Department of Forestry, Mataram University.

The tools used in the research were sasak herbarium, stationery, camera, books collection, pruning scissor, old newspapers, isolation, label paper, ivory paper and oven. While the materials used are spiritus (rubbing alcohol), herbarium specimen.

The type of this research is description which tend to exploration/survey. The data collection methods using survey and interview the people to get types of plants that grows in Sesaot Forest Area. From the survey result, identification has been done to know the scientific name of the plants, then from it species matched with the literature to know the plants that can be used as raw materials for the soap making. Each type of the specimens will be taken which consist of the vegetative parts (leaves and twigs) also the generative parts (flowers and fruits) if any.

3. Result And Discussion

From the result of the identification the plants that existed in Sesaot HKm are *Pterospermum javanicum, Theobroma cacao, Erythrina* sp., *Durio zibethinus, Coffea canephora, Swietenia macrophylla, Paraserianthes falcataria, Nephelium lappaceum, Syzygium polyanthum, Vanilla planifolia, Musa x paradisiaca, Persea americana, Ceiba pentandra, Aleurites moluccana* and *Piper betle*.

While there are the same plants that founded in community forest as HKm, namely coconut (*Cocos nucifera*), ylang (*Cananga ordorata*), white campaka (*Magnolia alba*), yellow campaka (*Magnolia champaca*), jasmine (*Jasminum sambac*), rose (*Rosa hybrida*), pandanus (*Pandanus amaryllifolius*), clove (*Syzygium aromaticum)*, tamarind (*Arenga pinnata*), agarwood (*Gyrinops verstegii*), frangipani (*Plumiera rubra*), and white frangipani (*Plumiera alba*).

The type of plants that found in Sesaot Forest Area as sopa's raw ingredients are *Theobroma cacao, Durio zibenthinus, Coffea canephora, Nephelium lappaceum, Syzygium*

polyanthum, Vanilla planifolia, Musa x paradisiaca, Persea americana, Ceiba pentandra, Aleurites moluccana, and *Piper betle.* While the plants that located in community forest as raw ingredients of the soap are coconut (*Cocos nucifera*), ylang (*Canaga ordorata*), white campaka (*Magnolia alba*), yellow campaka (*Magnolia champaca*), jasmine (*Jasminum sambac*), rose (*Rosa hybrida*), pandanus (*Pandanus amaryllifolius*), clove (*Syzygium aromaticum*), palm sugar (*Arenga pinnata*), and agarwood (*Gyrinops verstegii*).

The dominant species or the plants that become source of income now in agroforestry system in HKm Sesaot is durian, rambutan, avocado, coffee, cocoa, piper betel, and banana. According to the interview from the community, this species of plants is the species which have a high economic value if it sold in traditional market. From the interview to the HKm Area community, they can earn about 9.000.000 – 13.000.000 Rupiahs per ha. That product usually sold in raw form. While the dominant species in community forest except that type is coconut. while the other species is just have potential to become essential oil as ylang (*Canaga ordorata*), yellow campaka (*Magnolia champaca*), white campaka (*Magnolia alba*), jasmine (*Jasminium sambac*), rose (*Rosa hybrida*), pandanus (*Pandanus amaryllifolius*) only sold in limited amount in traditional market in Keru Village, district of Narmada, West Lombok Regency. They sell it in form of flowers and leaves as aoffers to worship by the Hindus.

Unlike the piper betel, it has more economic value because of the high market demand to consume or chewing the piper betel by some of the people of Lombok. Production per hA can reach 10-50 kg with the price of 50.000 Rupiah/kg. Piper betel is very potential become raw ingredients of the soap, this is because the piper betel has a function as a natural antiseptic. So when it used as a soap ingredients, many of piper betel soap favored by the local and international tourist.

4. Conclusion

From the result of the research and discussion, it can be concluded as:

There are nine types of potential plants that can be used as raw ingredients/materials which are coconut (*Cocos nucifera*), Candlenut (*Alurites muloccana*), avocado (*Persea americana*), coffee (*Coffea canephora*), cocoa (*Theobroma cacao*), piper (*Piper betle*), curcuma (*Curcuma longa*), yellow campaka *(Magnolia champaca),* white campaka (*Magnolia alba*), frangipani (*Plumiera rubra*), and white frangipani (*Plumiera alba*).

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Growth an Yield of Onion (*Allium Cepa Var. Ascalonicum*) as CA Result of Addition of Biocompost and Boactivity Fermented with *Trichoderma* spp.

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Abstract

The aim of this research was to look at the effect of biocompost and bioactivator fermented with trichoderma spp and their interaction on growth and yield of onion. A field experiment was conducted in Inceptisol at Seteluk Village, sub district of Batulayar and District of West Lombok. The treatments were split plot design which was consist of two main factors (1) with biocompost 20 t/ha and (2) without biocompost. The sub main plot was bioactivator consist of 5 levels mainly (a) without bioactivator, (b) 5 g/plant, (c) 10 g/plant, (d) 15 g/plant and (e) 20 g/plant. The result of this study showed that there was a significant higher on growth and yield of onion after addition of biocompost compared with without addition of biocompost. There was no interaction between biocompost and bioactivator. Furthermore, the effect of addition of biocompost at level of 10 g/plat resulted to the highest growth and yield of onion compared with other levels addition of biocompost.

Keywords: *biocompos, bioactivator, Trichoderma* spp., *onion, allium cepa* L.

1. Introduction

Onion*(Allium cepa var. ascalonicum.)* is becoming very populer horticultural crops in Indonesia due to its high econonomical value as well as its multi used of onion for food flavour and medical or pharmatical materials (Anonim, 2014). West Nusa Tenggara Province is one of the centra onion production in Indonesia after East Java, Central Java and West Java Province. However, the onion production in Indonesia is still low due to some constrains in the crop production systems.

Some factors that are responsible low production of onion in the West Nusa Tenggara Province are the use of low quality of seed and conventional farming practice by using high levels of inorganic fertilzer such as NPK Fertilizer (Sudhanta, 2015).

The use of bioactivator containing saprofit funggi of T. harzianumi and isolate of SAPRO-07 and funggi endofit of T. koningii isolate has been reported increased growth and yield of vanilia (Sudantha 2010a), increased growth and yield of corn (Sudantha and Suwardji,2013), increased growth and yield of soy bean (Sudantha and Suwardji, 2014), increase growth and yield of onion in the pot trial (Sudantha 2015).

In this paper we reported result of field trial the effect of biocompost and bioactivator fermented with Trichoderma spp on growth and yield of onion in the field trial.

2. Materials and Methods

Field trial was conducted at Seteluk Village, sub district of Batulayar and District of West Lombok from June to August 2016. Split plot experimental design was used to set up this field experiment which was consists of main treatment bioacompost (1) with biocompost 20 t/ha and (2) without biocompost. Sub treatments were application of bioactivator which consist of five levels mainly (a) without bioactivator (b) 5 g/plant of bioactivator (c) 10 g/plant of bioactivator (d) 15 g/plant of bioactivator and (e) 20 g/plant of bioactivator. The treatment was repeated three times, resulted in 2 x 5 x 3 = 30 experimental plots.

Biocompost of coconut shell was crushed and sieved with a 1.0 mm, then moistened with

T. koningii (Endo-04) and *T. harzianum* (isolates Sapro-07) suspense, where been grown on PDA. Solution was used water solvents which added 2.5 g granular sugar. The density of spore in suspension were 10^7 spores/ml. This solution is commonly known as Biotricon. Biocompost compounds had been added Biotricon were at 20-24% in moisture content. Biocompost was placed in container and sealed properly in anerobic condition and incubated in the room temperature. The incunbation period was used 28 days.

Fungi *Trichoderma* spp. was used in this study and had been cultured *T. koningii* isolates Endo-04 and *T. harzianum* isolates Sapro-07, were collected by Sudantha stored in Laboratory of Plant Protection, Agriculture Faculty, Universitas Mataram. Growing up used PDA (Potato Dextrosa Agar) with incubation period were 14 days.

The Bioactivator was made of leaves coffee had been dried at 60^0C for 14 days, after that it was crushed with a coffee mill and then sieved. The result of sieve powder was mixed with clay at 1:3 (v/v) in ratio then sterilized with *autocave*. The mixing matters were inoculated with fungi conidial biomass suspense *T. koningii* ENDO-2 and *T. harzianum* SAPRO

Plots size were 5x2 m^2 croping spaces were 25 cm x 20 cm, so there were 200 plant per plot. Onion seed seeds used was cultivar of Philip. Planting hole at depth of 2.5 cm. Combination of biocompost and bioactivator were applied on treatment basis as discussed above. During the growing season, water was applied based on furrow irrigation based on its onion requirement and weeding also applied at 20, 40, and 60 days after planting. Harvesting was done after 103 days after planting.

Data were analsysed using analysis of variance (2009), any significant different among means were then tested using Ducan's Multiple Test at probability level 95%.

3. Results and Discussion

3.1. Characteristis of Biocompost and Soil's Chemical Properties after Fermentation and Addition of Biocompost Fermented with *Trichoderma* spp.

Fermentation of biocompost using trichoderma spp affected the biocompost and soil properties. Chemical tests showed that there were decreased of biocompost pH and C/N ratio, but enhanced %-N. One of the most important of the benefit of fermentation was reducing C/N ratio. This has a significant implication on accelerating degradation of biocompost and become nutrient that may available for plant growth. Similarly fermentation biocompost also increased cation exchange capacity (CEC) (***Table 1.***).

Table 1. Chemical Change of Biocompost and Soi Properties after Fermentation and Application of Fermented Biocompost

Parameters	*BC Properties*			*Soil Properties*[a]					
	BC	FBC	Anova[b]	Basic	Soil (control)		Soil + BCT (20 tons/ha)		Anova[b]
				≤-1st Day	30th Days	60th days	30th Days	60th Days	
pH (H_2O)	7,8	7,2	*	6,5	6,4	6,5	6,4	6,2	ns
CEC ($cmol_c\ kg^{-1}$)	23,81	26,28	*	12,25 a	11,66 a	12,41 ab	14,53 c	14,24 bc	*
C (%)	62,00	60,00	*	2,80	2,65	3,10	3,15	3,00	ns
N (%)	0,37	0,82	**	0,18 a	0,23 ab	0,34 d	0,25 bc	0,31 cd	*
C/N Ratio	167	73	**						
Soil Respiration ($\mu mol\ CO_2\ kg^{-1}\ ha^{-1}$)	-	-		9,21 a	12,42 b	11,83 b	12,05 b	13,62 b	*

[a]*Means followed by the same letter at each row are not significantly different (P<0.05)*

Using this fermented biocompost (FBC) were 20 tons ha^{-1}, results of statistical

analysys on chemical tests showed that the fermentation of BC has no significance different effect on Biocompost pH and soil organic carbon (SOC), but significatly increased cation exchange capacity (CEC), %-N, C/N ratio and soil respiration.

Increasing CEC of soil were higher in soil applied FBC both on 30 and 60 days after application measured than without FBC application at the same period (30^{th} and 60^{th} days). By comparing before (1^{st} day = 12.25 $cmol_c$ kg^{-1}) and after fermentation and application both without FBC (30th $cmol_c$ days = 11.66 $cmol_c$ kg^{-1} and 60^{th} days = 12.61 $cmol_c$ kg^{-1}) and with FBC application (Soil+FBC in 30^{th} days = 14.53 $cmol_c$ 1^{st} kg^{-1} and 60^{th} days = 14.24 $cmol_c$ kg^{-1}) also showed improvement

3.2. Effect of Biocompost and Bioactivator on The Growth of Onion

Results of analysis of variance showed that application of both fermented biocompost and level of bioactivator were both significantly increased on plant heigh at 14,21,28 and 35 days after planting (DAP). Furthermore analysis using Least Square Different (LSD) at probability 95% can be seen at Tabel 1 and 2.

Tabel 1. The influence of biocompost on the hight of plant

Treatments	Mean the heigh of Onion Plant (cm)			
	14 DAP	21 DAP	28 DAP	35 DAP
With Biocompost	23,03 a [1)]	27,34 a[1)]	30,31 a[1)]	32,73 a [1)]
Without Biocompost	21,78 b	24,66 b	26,23 b	28,81 b
LSD P< 5%	1,10	2,98	3,86	3,12

1) Means followed with the same letter in the same colum are not significantly different.
2) DAP = Day after planting

Table 1 showed that the addition of biocompost fermented with Trichoderma spp significantly increased plant heigh at 14 DAP, 21 DAP, 28 DAP and 35 DAP compared with the height of plant without addition of biocompost. Sudantha and Suwardji (2016) advocated that addition of fermented biocompost with Trichoderma spp was able to accelerate the vegetative growth of onion. Similarly Salisbury dan Ross (1995) found that some fungi that life in the soil can produce etylence that are able to stimulate the growth of plant and also able to protect the plant from root rot desease. Moreover ethelence produced by the fungi is also able to speed up the flowering time. Sudantha (2010a) also found that fungi of endofit *Trichoderma* spp. was able to colonize in the plant tissues. As a result of ethylence produced in the plant tissues, the plant was cappable of accelerating the growth of plant tissue. Moreover, Trautman dan Olinceiw (1996) reported that Trichoderma harzianum was able to produce cellulose enzime that are capable of decomposing organic matter containing lignin and cellulose to the simple compounds which are disolve in soil solution and becoming available for plant growth and development.

Table 2. Influence of Bioactivator Level on Plant Heigh of Onion

Treatment of Bioactivator	Mean of Onion Plant Heigh(cm)			
	14 DAP	21 DAP	28 DAP	35 DAP
Without bioactivator	21,30 a[1)]	24,10 a[1)]	26,08 a[1)]	27,10 a[1)]
5 g/plant	22,51 b	25,75 b	27,25 b	31,22 b
10 g/plant	22,75 bc	26,74 bc	28,43 bc	32,67 bc
15 g/plant	23,74 c	27,28 c	28,67 c	32,74 c
20 g/plant	23,71 c	27,37 c	28,70 c	32,73 c
LSD at P < 5%	1,27	1,51	1,03	1,35

1) Values followed by the same symbon in the same colum are not sigficantly different at P<5%
2) DAP= Day after planting

Table 2 showed that the level of bioactivator significanly influenced plant heigh of

onion at 14 DAP, 21 DAP, 28 DAP and 35 DAP. All treatments were significantly increased plant heigh. Comparing the levels of treatments, doses of 10 g/plant of bioactivator considered to be the level that is significanly increase the plant heigh and economicly viable. This results suggested that bioactivator containing fungi of *T. koningii* isolat Endo-02 dan *T. harzianum* isolat Sapro-07 can stimulate plant height of onion.

Our data also suggested that bioactivator containing fungi of *T. koningii* isolat Endo-02 dan *T. Harzianum* isolat Sapro-07 were more prominent in increasing the heigh of pant of onio compared with biocompost suggesting that the use of bioactivatior may economically viable and practically more easy for farmers. Similar results has been reported by Sudantha et al (2016) suggested that 10g/plant of bioactivator can significantly increased the plant heigh of onion and economically viable conducted in other research for othe soil types. As previously reported that Sudantha (2010b) also found that fungi endofit *T. koningii* isolat ENDO-02 in the plant tissue produced etylence which able to stimulate vegetative growth of plant.

Further statistical test using LSD at P <5% for the influence of biocompost conducted independently on other plant parameters suggested that bioactivator significanly inreased number of tillering, fresh weigh of plant and number of plant bulb of onion (Table 3).

Table 3. Influence of biocompost on number of tillering, fresh weight of plant and fresh bulb weight of onion

Treatments	Number of tillering (bulb/rumpun)	Fresh weight of plant (g/rumpun)	Fresh bulb of onion (g/rumpun)
With biocompost	6,78 a[1])	39,11 a[1])	33,57 a[1])
Without biocompost	5,13 b	27,38 b	22,42 b
LSD 5%	1,63	1,02	1,77

1) Values followed by the same symbon in the same colum are not sigficantly different at P<5%

Table 3 suggested that addition of biocompost significantly increased number of tillering and fresh weight plant and fresh weight of bulb. This results similar to the results of Sudantha et al (2016) in the glass house experiment that addition of biocompost significantly increase number of tillering, plant fresh weight and fresh weight of bulb of onion. Furthermore Sudantha dan Suwardji (2013) also found application of biocompost fermented with fungi of endofit and saprofit *Trichoderma* spp increased plant heigh dan development of onion and yield of onion.

Table 4. Influence of bioactivator on number of tillering, fresh weight of plant and fresh bulb of onion

Treatments	Number of tillering (bulb)	Fresh weight of plant (g)	Fresh weight of bulb (g)
Without bioactivator	4,91 a [1])	29,42 a [1])	23,71 a [1])
5 g/plant	5,36 b	32,36 b	27,11 b
10 g/plant	5,62 bc	35,10 bc	28,06 bc
15 g/plant	5,87 c	35,56 c	30,86 c
20 g/plant	5,93 c	36,48 c	31,02 c
LSD P<0,5%	0,50	2,75	2,95

1) Values followed by the same symbon in the same colum are not sigficantly different at P<5%

Table 4 showed that aplication of bioactivator containing fungi of *T. Koningii* isolate Endo-02dan *T. harzianum* isolat Sapro-07 significantly increased number of tillering,fresh weight plant and fresh weight of bulb in comparation with witthout application of bioactivator. The data also suggested that application of bioactivator 10g/plant also significantly increased number of tillering and fresh weight plant and fresh weight of bulb.

The fact indicated that application of bioactivator capable of increasing yield of onion due to the dominant role of fungi of *T. harzianum* isolat Sapro-07. Similar reason that have been suggested in the above paragraph are apply for increasing of yield of onion as a result of application of bioactivator.

4. Conclusion

Result of this study suggested that the addition of biocompost to the soil resulted in higher growth and yield of onion compared with without addition of biocompost. In addition, the growth and yield of onion become much more higher with the additon of bioactivator at level up to 10 t/ha.

Further research should be directed to look at the method of application of biocompost and bioactivator to achieve potential yield of onion used in this study.

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